Final

2010 URBAN WATER MANAGEMENT PLAN

Prepared for:

JOSHUA BASIN WATER DISTRICT

Prepared by:
Kennedy/Jenks Consultants

June 2011

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Final 2010 Urban Water Management Plan

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Prepared for

Joshua Basin Water District
61750 Chollita Road
Joshua Tree, CA 92252

K/J Project No. 1089048*00

RESOLUTION 11-871

RESOLUTION OF THE GOVERNING BOARD OF JOSHUA BASIN WATER DISTRICT ADOPTING THE 2010 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Urban Water Management Planning Act, Water Code section 10610 et seq. (the Act) mandates that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water annually, prepare and adopt an updated Urban Water Management Plan (UWMP) at least once every five years on or before December 31, in years ending five and zero; and

WHEREAS, the Joshua Basin Water District (JBWD) is an urban water supplier for purposes of the Act, and approved and adopted its most recent 2005 UWMP and submitted that UWMP to the California Department of Water Resources (DWR); and

WHEREAS, the Water Conservation Act of 2009, Water Code section 10608 et seq. (SBX7-7), extended the time by which urban retail water suppliers must adopt their 2010 UWMPs to July 1, 2011 and, among other things, established requirements for urban retail water suppliers to prepare urban water use targets in accordance with the goals of SBX7-7 to reduce statewide daily per capita water use 15 percent by the year 2015 and 20 percent by the year 2020; and

WHEREAS, the JBWD is an "urban retail water supplier" for purposes of SBX7-7 because it directly provides potable municipal water to more than 3,000 end users; and

WHEREAS, in accordance with applicable law, including the requirements of the Act and SBX7-7, the JBWD has prepared its 2010 UWMP and has undertaken certain agency coordination, public notice, public involvement and outreach, public comment, and other procedures in relation to its 2010 UWMP; and

WHEREAS, as authorized by Section 10620(e) of the Act, the JBWD has prepared its 2010 UWMP with its own staff, with the assistance of consulting professionals, and in cooperation with other governmental agencies, and has utilized and relied upon industry standards and the expertise of industry professionals in preparing its UWMP, and has also in part utilized and relied upon the DWR Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan (March 2011) and the DWR Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009) (February 2011) in preparing its 2010 UWMP; and

WHEREAS, in accordance with applicable law, including Water Code sections 10608.26 and 10642, and Government Code section 6066, the JBWD made its

Draft 2010 UWMP available for public inspection, and caused to be published within the jurisdiction of the JBWD at least two notices of public hearing regarding the JBWD's 2010 UWMP, which publication dates included May 14, 2011, and May 21, 2011.

WHEREAS, the JBWD held its public hearing on Wednesday, September 15, 2011, in the Board Room of the JBWD, located at 61750 Chollita Road, Joshua Tree, California, regarding its 2010 UWMP, wherein, among other things, members of the public and other interested entities were provided with the opportunity to be heard in connection with the JBWD's 2010 UWMP and the proposed adoption thereof; and

WHEREAS, pursuant to said JBWD public hearing on the 2010 UWMP, the JBWD encouraged the active involvement of diverse social, cultural, and economic elements of the population within the JBWD's service area with regard to the preparation and adoption of the 2010 UWMP, provided for the extensive review by the JBWD Citizens Advisory Committee, encouraged input by members of the public and any other interested parties regarding all aspects of the 2010 UWMP, encouraged community input regarding the JBWD's implementation plan for complying with SBX7-7, considered the economic impacts of the JBWD's implementation plan for complying with SBX7-7, and adopted Method 3 under Water Code section 10608.20(b) for determining the JBWD's urban water use targets; and

WHEREAS, the Board of Directors of the JBWD has reviewed and considered the purposes and requirements and of the Urban Water Management Planning Act and SBX7-7, the contents of the 2010 UWMP, the documentation contained in the administrative record in support of the 2010 UWMP, and all public and agency input received with regard to the 2010 UWMP, and has determined that the factual analyses and conclusions set forth in the 2010 UWMP are supported by substantial evidence.

NOW THEREFORE, BE IT RESOLVED, DETERMINED AND ORDERED BY THE BOARD OF DIRECTORS OF THE JBWD AS FOLLOWS:

1. The JBWD Board of Directors hereby adopts Method 3 under Water Code section 10608.20(b) for determining its urban water use targets, and the 2010 Urban Water Management Plan is hereby approved and adopted and ordered filed with the Secretary of the Board.

2. The General Manager of the UWMP is hereby authorized and directed to include a copy of this Resolution in the JBWD's 2010 Urban Water Management Plan and, in accordance with Water Code section 10644(a), to file the 2010 Urban Water Management Plan with the California Department of Water Resources, the California State Library, and any city or county within which the JBWD provides water supplies within thirty (30) days of this adoption date.

3. The General Manager is hereby authorized and directed, in accordance with Water Code section 10645, to make the 2010 Urban Water Management

Plan available for public review during normal business hours not later than thirty (30) days after filing a copy thereof with the California Department of Water Resources.

4. The General Manager is hereby authorized and directed, in accordance with Water Code section 10635(b), to provide that portion of the 2010 Urban Water Management Plan prepared pursuant to Water Code section 10635(a) to any city or county within which the JBWD provides water supplies not later than sixty (60) days after filing a copy thereof with the California Department of Water Resources.

5. The General Manager is hereby authorized and directed to implement the components of the 2010 Urban Water Management Plan in accordance with the Urban Water Management Planning Act and SBX7-7, including, but not limited to, the JBWD's Water Conservation Programs and its Water Shortage Contingency Plan.

6. The General Manager is hereby authorized and directed to recommend to the Board of Directors additional steps necessary or appropriate to effectively carry out the implementation of the 2010 Urban Water Management Plan, the Urban Water Management Planning Act and SBX7-7.

PASSED AND ADOPTED at a regular meeting of the Governing Board of the Joshua Basin Water District held on June 15, 2011 by the following vote to wit:

AYES:	3: Luckman, Reynolds, Long
NOES:	0
ABSTAIN:	0
ABSENT:	2: Luhrs, Wilson

JOSHUA BASIN WATER DISTRICT

By Mickey Luckman
Mickey Luckman, President, Board of Directors

Attest Joe Guzzetta
Joe Guzzetta, Secretary, Board of Directors

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Section 1: Introduction

1.1 Overview

This volume presents the Urban Water Management Plan 2010 (Plan) for the Joshua Basin Water District (District, JBWD) service area. This chapter describes the general purpose of the Plan, discusses Plan implementation, and provides general information about JBWD, and service area characteristics. A list of acronyms and abbreviations is also provided.

1.2 Purpose

An Urban Water Management Plan (UWMP) is a planning tool that generally guides the actions of water management agencies. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan include a section which “describes the opportunities for exchanges or water transfers on a short-term or long-term basis.” (California Urban Water Management Planning Act, Article 2, Section 10630(d).) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor precludes a water management agency from exploring exchange/transfer opportunities not identified in the plan. When specific projects are chosen to be implemented, detailed project plans are developed, environmental analysis, if required, is prepared, and financial and operational plans are detailed.

In short, this Plan is a management tool, providing a framework for action, but not functioning as a detailed project development or action. It is important that this Plan be viewed as a long-term, general planning document, rather than as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty, and planning projections may change in response to a number of factors. From this perspective, it is appropriate to look at the Plan as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these “framework” questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands. JBWD will explore enhancing basic supplies from traditional sources such as imported water from the Mojave Water Agency (MWA) as well as other options. These could include groundwater extraction, water exchanges, recycling, desalination, and water banking/conjunctive use. Specific planning efforts will be undertaken in regard to each option, involving detailed evaluations of how each option would fit into the overall supply/demand framework, how each option would impact the environment, and how each option would affect customers. The objective of these more detailed evaluations would be to find the optimum mix of conservation and supply programs that ensure that the needs of the customers are met.

The California Urban Water Management Planning Act (Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five year increments. (JBWD is going beyond the requirements of the Act by developing a plan which spans 25 years.)
- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry, and multiple-dry years.
- Implements conservation and efficient use of urban water supplies. Significant new requirements for quantified demand reductions have been added by the enactment of SBX7-7, which amends the Act.

A checklist to ensure compliance of this Plan with the Act requirements is provided in Appendix A.

In short, the Plan answers the question: *Will there be enough water for the Joshua Basin community in future years, and what mix of programs should be explored for making this water available?*

It is the stated goal of JBWD to provide a high standard of water quality and customer service at a responsible cost, to protect the water resources of the Joshua Basin Water District, and to promote cooperation and respect among customers, employees, neighboring communities and public-private agencies. Based on conservative water supply and demand assumptions over the next 25 years in combination with conservation of non-essential demand during certain dry years, the Plan successfully achieves this goal.

1.3 Implementation Of The Plan

Water Code Section 10617 defines an urban water supplier as any supplier that provides water to more than 3,000 service connections or supplies more than 3,000 acre-feet (af) of water annually. Currently JBWD delivers water to over 4,200 connections, therefore requiring the District to prepare and adopt an UWMP. This Plan has been prepared for the JBWD.

1.3.1 Joint Preparation of the Plan

JBWD cooperates with the MWA in managing the region's water resources. The District consulted MWA's Draft 2010 UWMP while preparing this UWMP. MWA was also notified that the District is updating its UWMP and input was solicited. JBWD coordinated the preparation of the Plan with the local community. Nearby cities including Yucca Valley and Twentynine Palms and the County of San Bernardino were notified of the opportunity to provide input regarding the Plan. Water resource specialists with expertise in water resource management were retained to assist the District in preparing the details of the Plan. Agency coordination for this Plan is summarized in Table 1-1.

TABLE 1-1
AGENCY COORDINATION SUMMARY

	Participated in UWMP Development	Received Copy of Draft	Comment on Draft	Attended Public Meetings	Contacted for Assistance	Sent Notice of Intent to Adopt	Not Involved
Mojave Water Agency		✓				✓	
Bighorn-Desert View Water Agency		✓				✓	
Hi-Desert Water District		✓				✓	
Twentynine Palms Water District		✓		✓		✓	
Twentynine Palms Marine Corps Base		✓				✓	
San Bernardino County Planning Department		✓				✓	

1.3.2 Plan Adoption

JBWD began preparation of this Plan for the JBWD service area in early 2010. The final draft of the Plan was adopted by the Agency Board in June 2011 and submitted to DWR within 30 days of Board approval. This Plan includes all information necessary to meet the requirements of Water Conservation Act of 2009 (Wat. Code, §§ 10608.12-10608.64) and the Urban Water Management Planning Act (Wat. Code, §§ 10610-10656).

1.3.3 Public Outreach

JBWD has encouraged community participation in water planning. Several public sessions were held by the Citizens Advisory Committee representing local stakeholders, and a public hearing was held by the Board of Directors for review and to solicit input on the Draft Plan before its adoption. Interested groups were informed about the development of the Plan along with the schedule of public activities. Notices of public meetings were published in the local press. Copies of the Draft Plan were made available on the District's website, at the local public library and sent to the County of San Bernardino, as well as interested parties.

JBWD has and continues to actively encourage community participation in its on-going water management activities and specific water related projects. The District's public participation programs include mailings, public meetings, and web-based communication. The District's water conservation program involves a variety of public awareness programs. The District has regularly scheduled Board of Director's meetings that include extensive public comment on water issues.

The District encouraged public participation through the Citizen's Advisory Committee meetings as shown on Table 1-2. Also, this table presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials, including paid advertisements, newsletter covers, website postings, and invitation letters are attached in Appendix B.

TABLE 1-2
PUBLIC PARTICIPATION TIMELINE

Date	Event	Description
January 4, 2011 April 12, 2011	Draft UWMP	Citizens Advisory Committee Reviewed Portions of Preliminary Draft and Draft UWMP
May 11, 2011	JBWD Public Meeting	Review contents of Draft UWMP and take comments with Citizens Advisory Committee
May 25, 2011	JBWD Public Meeting	Receive comments on Draft UWMP with Citizens Advisory Committee
June 15, 2011	JBWD Public Hearing	UWMP considered for approval and adoption by the JBWD Board

The components of public participation include:

Local Media

- Paid advertisements in local newspaper (Hi-Desert Star)

Community-based Outreach

- Building Industry Association – sent copy of Draft 2010 UWMP
- Citizen's Advisory Committee

City/County Outreach

- Meeting with MWA Planning Division
- County of San Bernardino

Public Availability of Documents

- JBWD website
- District Headquarters
- Local library

1.3.4 Resources Maximization

Several documents were developed to enable JBWD to maximize the use of available resources, including the following:

- *JBWD Water Master Plan – revised 2004,*
- *JBWD Groundwater Management Plan - 1996,*

- *Mojave Water Agency 2004 Integrated Regional Water Management Plan* (Regional Plan).

Chapter 3 of this Plan describes in detail the water supply available to JBWD for the 25-year period covered in this Plan. Additional discussion regarding documents developed to maximize resources is included in Section 3.2 and Chapter 6.

1.4 Joshua Basin Water District Background

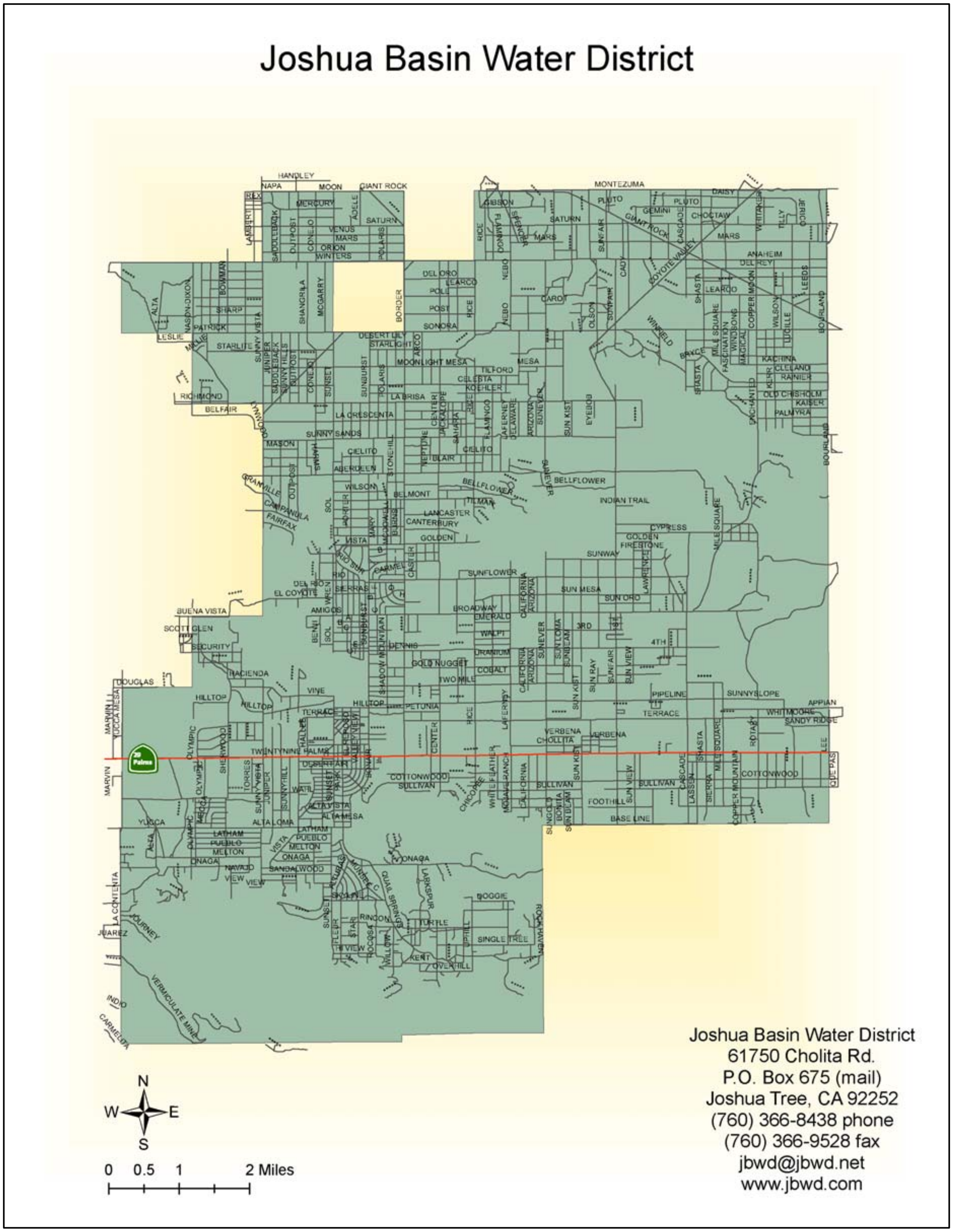
JBWD was formed as a public agency in 1963 when the District purchased and combined several small existing water systems. Today, the District serves more than 4,200 connections in a 100-square mile service area, between Yucca Valley, Twentynine Palms, Joshua Tree National Park and the Twentynine Palms Marine Corps Base. JBWD is one of ten retail water purveyors within MWA's service area that is required to complete an UWMP. MWA is a State Water Project (SWP) contractor that serves an area of 4,900 square miles of the high desert area.

JBWD is situated above the Copper Mountain and Joshua Tree groundwater subbasins. Copper Mountain and Joshua Tree are subbasins in the Morongo area. Together, the groundwater subbasins contain over 600,000 acre-feet (af) of water. JBWD's sole source of water is groundwater from these two basins. The basins are not adjudicated; for that reason there are no deeded rights to withdraw water. Overall management of water resources is the responsibility of JBWD pursuant to the Joshua Basin Water District AB3030 Groundwater Management Plan.

The District has local entitlements to SWP water supplies through cost participation with the MWA Morongo Basin Pipeline Project. Currently, JBWD has an agreement in place with MWA through which JBWD is entitled to up to 1,959 acre-feet per year (afy) of SWP water (depending on the percent of MWA's entitlement that it receives each year from the SWP) until 2022, which they cannot access without the extension of the Morongo Pipeline and construction of recharge facilities that would occur under the JBWD Proposed Recharge Basin and Pipeline Project. SWP water that would be delivered to the JBWD under the Proposed Project would provide some relief of the overdraft condition, eliminate ongoing overdraft by enabling the District to meet current water demands, or provide recharge water by bringing in slightly more water than the demand. The Proposed Project is currently designed and waiting for grant funding so construction can begin.

The service area for JBWD is shown on Figure 1-1.

FIGURE 1-1
JBWD SERVICE AREA



1.5 Climate

The Mojave Water Agency maintains a regional network of weather monitoring stations throughout the watershed, which some are funded by MWA and others are provided courtesy of various local and federal government agencies, and citizen observers program. The stations collect various weather data on temperature, precipitation, and evaporation. Rain gages are mostly located within the Mojave Basin Area and the surrounding mountains.

Representative precipitation, temperature, and reference evapotranspiration (ETo) data are reported in Table 1-3 for the period 1995 through 2007. Average annual precipitation during the same period was approximately 4 inches.

TABLE 1-3
CLIMATE DATA FOR THE JOSHUA BASIN WATER DISTRICT

	Jan	Feb	Mar	Apr	May	Jun
Standard Monthly Average ETo[(a)]	2.2	2.8	5.0	6.6	8.5	9.6
Average Rainfall (inches)[(b)]	0.4	0.4	0.3	0.1	0.1	0.0
Average High Temperature (ºF)[(b)]	62	65	72	80	90	100
Average Low Temperature (ºF)[(b)]	32	37	40	50	55	65

	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Standard Monthly Average ETo[(a)]	9.7	8.9	6.7	4.7	2.8	2.1	69.6
Average Rainfall (inches)[(b)]	0.6	0.7	0.3	0.3	0.3	0.5	4.0
Average High Temperature (ºF)[(b)]	105	101	96	85	72	62	83
Average Low Temperature (ºF)[(b)]	70	78	62	55	40	31	51

Notes:
(a) Average of CIMIS stations from Barstow and Victorville.
(b) http://www.joshua.tree.national-park.com/weather.htm

1.6 Potential Effects of Global Warming

A topic of growing concern for water planners and managers is global warming and the potential impacts it could have on California's future water supplies. DWR's California Water Plan Update 2009 considers how climate change may affect water availability, water use, water quality, and the ecosystem.[1]

Volume 1, Chapter 5 of the California Water Plan, "Managing an Uncertain Future," evaluated three different scenarios of future water demand based on alternative but plausible assumptions on population growth, land use changes, water conservation and also future climate change might have on future water demands. Future updates will test different response packages, or combinations of resource management strategies, for each future scenario. These response packages help decision-makers, water managers, and planners develop integrated water management plans that provide for resources sustainability and investments in actions with more sustainable outcomes.

[1] Final California Water Plan Update 2009 Integrated Water Management: Bulletin 160.

1.7 Other Demographic Factors

Water service is provided to residential, commercial, and some industrial customers and for other uses, such as fire protection and pipeline cleaning.

Over the past decade the Joshua Basin area (along with most of California) experienced significant increases in both single family and multi-family residential construction, as well as in commercial and industrial construction. As the local population has increased, the demand for water has also increased. However, the recent economic downturn, coupled with a three-year dry period during 2007-2010, has reduced demand on what is likely an interim basis.

1.8 List Of Abbreviations And Acronyms

The following abbreviations and acronyms are used in this report.

AB	Assembly Bill
ACOE	U.S. Army Corps of Engineers
Act	California Urban Water Management Planning Act
af	acre-feet
afy	acre-feet per year
AWAC	Alliance for Water Awareness and Conservation
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation
BMPs	Best Management Practices
CCF	One Hundred Cubic Feet
CCR	Consumer Confidence Report
CDP	Census Designated Place
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CII	Commercial Industrial and Institutional
CIMIS	California Irrigation Management Information System
County	San Bernardino County
CSA	County Service Area
CSD	Community Service District
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DBP	Disinfection by-products
Delta	Sacramento-San Joaquin Delta
District	Joshua Basin Water District
DMM	Demand Management Measures
DOF	California Department of Finance
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources

DWSAP	Drinking Water Source Assessment Program
EC	Electrical conductivity
Edison	Southern California Edison
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ETo	evapotranspiration
Final EIR	Final Environmental Impact Report
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GWMP	Groundwater Management Plan
HDWD	Hi-Desert Water District
HECW	high efficiency clothes washers
HET	high efficiency toilet
IDM	Improvement District Morongo
JBWD	Joshua Basin Water District
LAFCO	San Bernardino Local Agency Formation Commission
kW	kilowatt
M&I	Municipal and Industrial
MBP	Morongo Basin Pipeline
MCL's	Maximum Contaminant Levels
MCLG	Maximum Contaminant Level Goal
MFR	Multi-Family Residential
mgd	million gallons per day
mg/L	milligrams per liter
MMRP	Mitigation, Monitoring and Reporting Program
MOU	Memorandum of Understanding
MWA	Mojave Water Agency
NPDES	National Pollutant Discharge Elimination System
PCAs	possible contaminating activities
PHG	Public Health Goal
Plan	Urban Water Management Plan 2010
PUC	California Public Utilities Commission
PWSS	Public Water System Statistics
RAP	Remedial Action Plan
RO	Reverse Osmosis
Regional Plan	MWA's 2004 Regional Water Management Plan
RV's	recreational vehicles
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SBX7-7	Senate Bill 7 of Special Extended Session 7
SCAG	Southern California Association of Governments

SD	Sanitation District
SFR	Single Family Residential
SWP	State Water Project
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
ug/L	micrograms per liter
umhos/cm	micromhos per centimeter
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WAAP	Water Account Assistance Program
WC	water conservation
WCIP	Water Conservation Incentive Program
WIRP	Water Infrastructure Restoration Program
WRF	Water Reclamation Facility
WRP	Wastewater Reclamation Plant

Section 2: Water Use

2.1 Overview

This chapter describes historic and current water usage and the methodology used to project future demands within Joshua Basin Water District's (JBWD's) service area. Water usage is divided into sectors such as residential, industrial, landscape, and other purposes. To undertake this evaluation, existing land use data and new housing construction information were compiled from JBWD. This information was then compared to historical trends for new water service connections and customer water usage information. In addition, weather and water conservation effects on historical water usage were factored into the evaluation.

2.2 Population

The 2000 U.S. Census was used to obtain the initial population for the Joshua Tree Census Designated Place (CDP) in the Year 2000 which was 8,137. Population data for Years 2001-2009 were obtained using the following method: the number of service connections added by the District within the year was multiplied by the household size (District provided) to obtain the additional population growth for that year, which is then added to the previous year's population for the resulting revised population. Table 2-1 presents the estimated population from 2000-2009 for JBWD.

TABLE 2-1
JBWD CURRENT POPULATION ESTIMATES

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Estimated Household Size[b]		2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34
Additional Service Connections[b]		56	19	46	141	249	250	17	0	1
Estimated Population[c]	8,137[a]	8,268	8,313	8,420	8,750	9,333	9,918	9,958	9,958	9,960

Notes:
(a) 2000 Population is from 2000 U.S. Census data for Joshua Basin CDP.
(b) JBWD provided data.
(c) Population is calculated as household size times service connections.

Based on the District's assumptions, it is predicted that the population of JBWD's service area will grow at a rate of approximately 1.1 percent per year from 2005 through 2035. Table 2-2 presents projected population estimates calculated using information from Table 2-1 and then the Mojave Water Agency (MWA) forecast demand model to project the population to 2035. Please note the annual 1.1 percent change is stated to be approximate and the percent change between the five (5) year increments may not match exactly with the annual change. However, the average will match the 1.1 percent. In 2015, the population for 2010 was from actual data rather than projected and that is why there is a large variance in the percentage change between 2010-2015. The SCAG projection data that was used in the model was for year 2020 and we projected down each year from that number.

TABLE 2-2
JBWD PROJECTED POPULATION ESTIMATES

2005	2010	2015	2020	2025	2030	2035	Annual % Change 2005-2035
9,333	9,969	10,448	11,108	11,551	11,993	12,436	1.1%

Note: (a) Source is MWA's 2010 demand model forecast. Please note that 2010 is from actual data and is not projected.

JBWD is utilizing the same forecast population and demand model that MWA created and used for its 2010 Urban Water Management Plan (UWMP). JBWD is a retail water purveyor within MWA's service area and supplied MWA with the necessary data input for the model for their District. JBWD boundaries are indicated on Figure 1-1 in the previous chapter.

2.3 Historic Water Use

Predicting future water supply requires accurate historic water use patterns and water usage records. Figure 2-1 illustrates the change in water demand since 2000. The dramatic drop on 2007 is most likely be caused by the unusual economic downturn of the recent years and the effects of drought and conservation combined.

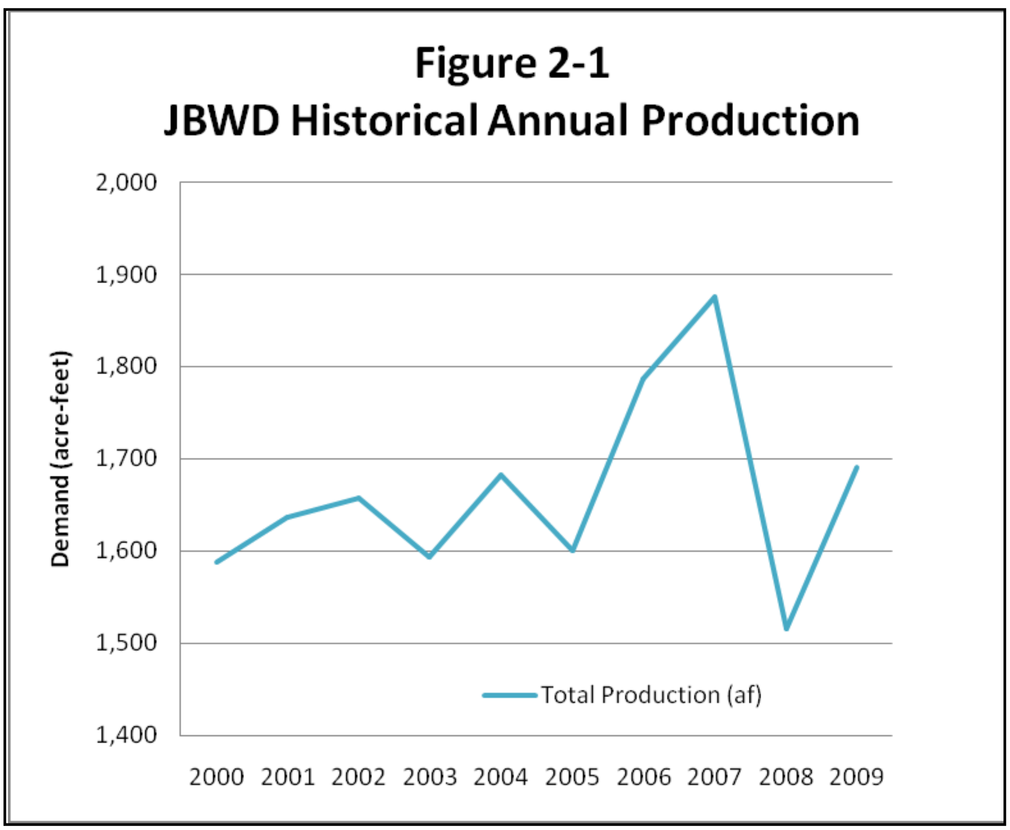


Table 2-3 presents the historical groundwater pumping quantities for the JBWD from 2000 through 2009.

TABLE 2-3
ANNUAL GROUNDWATER PRODUCTION FOR JBWD (AF)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
JBWD	1,588	1,636	1,657	1,593	1,683	1,600	1,786	1,875	1,515	1,690

Source: California Department of Water Resources (DWR) Public Water System Statistics (PWSS) data.

2.4 Existing and Targeted Per Capita Water Use in JBWD Service area

2.4.1 Base Daily Per Capita Water Use for SBX7-7 Reduction

As described in Senate Bill 7 of Special Extended Session 7 (SBX7-7), it is the intent of the California legislature to increase water use efficiency and the legislature has set a goal of a 20 percent per capita reduction in urban water use statewide by 2020. The requirements of SBX7-7 apply to retail water suppliers. Consistent with SBX7-7, the 2010 UWMPs must provide an estimate of Base Daily Per Capita Water Use. This estimate utilizes information on population as well as base gross water use. For the purposes of this UWMP, population was estimated as described in the previous section. Base gross water use is defined as the total volume of water, treated or untreated, entering the distribution system of JBWD, excluding: recycled water; net volume of water placed into long-term storage; and water conveyed to another urban water supplier. This calculation of Base Daily Per Capita Water Use is limited to JBWD's retail service area (as described in Chapter 1).

The UWMP Act allows urban water retailers to evaluate their base daily per capita water use using a 10 or 15-year period. A 15-year base period within the range January 1, 1990 to December 31, 2010 is allowed if recycled water made up 10 percent or more of the 2008 retail water delivery. If recycled water did not make up 10 percent or more of the 2008 retail water delivery, then a retailer must use a 10-year base period within the range January 1, 1995 to December 31, 2010. Recycled water did not make up 10 percent of the 2008 delivery to the JBWD retail areas and for this reason Base Daily Per Capita Water Use has been based on a 10-year period. In addition, urban retailers must report daily per capita water use for a five year period within the range January 1, 2003 to December 31, 2010. This 5-year base period is compared to the Target Based Daily Per Capita Water Use to determine the minimum water use reduction requirement (this is described in more detail in the following sections). Table 2-4 reports the data used to calculate the Base Daily Per Capita Water Use in gallons per capita per day (gpcd), and the 10-year and 5-year base periods.

TABLE 2-4
BASE DAILY PER CAPITA WATER USE

Base Period Year		Distribution System Population	Annual System Gross Water Use (afy)	Annual Daily Per Capita Water Use (gpcd)	10-Year Average (gpcd)	5-Year Average (gpcd)
Sequence Year	***Calendar Year***					
1	1995	7,638	1,521	178		
2	1996	7,638	1,596	187		
3	1997	8,140	1,658	182		
4	1998	8,174	1,463	160		
5	1999	7,980	1,323	148		
6	2000	8,137	1,588	174		
7	2001	8,268	1,636	177		
8	2002	8,313	1,657	178		
9	2003	8,420	1,593	169		
10	2004	8,750	1,683	172	**172.31**	
11	2005	9,333	1,600	153	169.85	
12	2006	9,918	1,786	161	167.27	
13	2007	9,958	1,875	168	165.90	**164.49**
14	2008	9,958	1,515	136	163.51	157.88
15	2009	9,960	1,690	151	163.86	153.84
				Period Selected		**164**

Note: Shaded cells show calendar years used in selected 5-year average.

2.4.2 Urban Water Use Targets for SBX7-7 Reduction

In addition to calculating base gross water use, SBX7-7 requires that JBWD identify their demand reduction targets for year 2015 and 2020 by utilizing one of four options:

- Option 1. 80 percent of baseline gpcd water use (i.e., a 20 percent reduction).
- Option 2. The sum of the following performance standards: indoor residential use (provisional standard set at 55 gpcd); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (80 percent ETo existing landscapes, 70 percent of ETo for future landscapes); plus 10 percent reduction in baseline commercial, industrial institutional use by 2020.
- Option 3. 95 percent of the applicable state hydrologic region target as set in the DWR "20x2020 Water Conservation Plan" (February, 2010) (20x2020 Plan).
- Option 4. Not applicable.

JBWD's service area is within the Colorado Hydrologic Region (#10) as defined by DWR and this hydrologic region has been assigned a 2020 water use target of 211 gpcd per the DWR 20x2020 Plan. Therefore, in order to use Option 3, JBWD's daily per capita water use for the 5-year base period would have to be close to 95 percent of the 211 gpcd target (i.e., 200 gpcd), which it is. The calculated base gross water use is well below the 95 percent limit at 164 gpcd. Therefore, to comply with the SBX7-7 ruling, the District selects Option 3 to reduce their Base Daily Per Capita Water Use by 5 percent. This results in the 2020 gpcd target for JBWD to be 156 gpcd as shown in Table 2-5.

TABLE 2-5
COMPONENTS OF TARGET DAILY PER CAPITA WATER USE

Period	Value		Unit	
10-year period selected for baseline gpcd	*First Year*	1995	*Last Year*	2004
5-year period selected for maximum allowable gpcd	*First Year*	2003	*Last Year*	2007
Highest 10-year Average	172		gpcd	
Highest 5-year Average	164		gpcd	
Compliance Water Use Target (20% Reduction on 10yr)	138		gpcd	
Maximum Allowable Water Use Target (5% Reduction 5yr)	156		gpcd	
2020 Target	**156**		gpcd	
2015 Interim Target	**160**		gpcd	
Methodology Used	Option No. 3			

JBWD plans to meet the proposed 20x2020 water use target using the existing methods of conservation that have been working to date for the District and other methods discussed in Section 2.6.2 and Chapter 7 Demand Management Measures.

2.5 Projected Water Use

2.5.1 Water Use Data Collection

Current water use data were collected and identified by water use sector, to allow for detailed analysis and for making different assumptions about each type of water use for future years. Data was compiled from various sources, depending upon what was available. In addition to water use data, the number of residential service connections was collected to estimate service area population and per capita water use.

For production records, DWR annual PWSS (2009) data were used, if available, because they collect metered water deliveries by customer class and number of connections by customer class. Where DWR data were not available, water production and connection data were gathered from a combination of sources that provided a complete data set, including annual reports to the California Department of Public Health (CDPH), surveys sent to the retail water purveyors by the Alliance for Water Awareness and Conservation (AWAC), and data provided directly from JBWD.

2.5.2 Demand Forecast Methodology

JBWD maintains historical data and works closely with property owners and developers in its service area to ensure it has an adequate water supply and the necessary infrastructure to provide water service.

Water uses were broken into five categories, and assumptions were made about each for projections going forward in order to be as accurate as possible. Demand projections were based largely on population growth. Please note that only the water use sectors used in JBWD are discussed. The typical sectors that are not discussed include Industrial or Agricultural, which are not used by the District. All other sectors are explained and the assumptions used in the projection model are described below:

1. Single Family Residential (SFR): Single Family detached dwellings. SFR projections were made based upon gpcd and population (gpcd was converted to acre-feet per year (afy) multiplied by yearly SFR population to calculate demand in afy). For years 2000-08, the gpcd was calculated in the model by converting total SFR demand to gallons per day (gpd) and dividing by SFR population. The average of the gpcd in years 2000-08 was the baseline for gpcd projections, and gpcd is assumed to change depending upon the level of conservation that takes place in future years. The projections were made assuming the SFR GPCD remains at the 2008 level (129 GPCD).

2. Multi-Family Residential (MFR): Multi-Family dwellings. MFR projections used the SFR method with the MFR population calculated as total population minus SFR population.

3. Commercial/Institutional/Industrial (CII): Called Commercial/Institutional in the DWR 2009 PWSS, and defined as “Retail establishments, office buildings, laundries, schools, prisons, hospitals, dormitories, nursing homes, hotels” (not intended to include Industrial/Manufacturing). However, JBWD included metered industrial use in with this category, primarily because they do not separate commercial and industrial customers in their billing systems. Industry included in this category is considered “baseline use” because it accounts primarily for smaller industries and shops associated with the local population. Specific major projects that are currently in development stages were included in the projections:

   - Cascade Solar Plant: This proposed facility is to be constructed by 2013 and operate as an 18.5-megawatt solar photovoltaic electricity generation facility on approximately 150 acres. The project site is located east of Lawrence Avenue straddling Broadway in the Sunfair community in the JBWD service area. The project is estimated to have a constant minimum water demand of approximately 2 afy.

   A linear regression method was used to determine the relationship between population growth and CII usage and to project forward using linear regression. Future CII demand is correlated to population using the following formula:

   CII demand = -49.85 + 0.0295x where x is the current population

   Because the growth is unpredictable, the model does not assume any conservation in this category.

4. Other: Defined in the DWR 2009 PWSS as “fire suppression, street cleaning, line flushing, construction meters, temporary meters.” These uses are assumed to grow with population. Construction water is likely to have varied significantly over the 2000-08 period due to changing rates of growth, so “Other” use is projected to increase in proportion with increases in population based upon the average per-capita use for the period of 2000-08.

5. Unaccounted: Calculated as the difference between total water production and metered deliveries reported by JBWD. From 2000-08, Unaccounted water averaged 13 percent of total municipal production. The makeup of this category is not known; however, based upon conversations with professionals in retail water distribution, it is likely that this difference is comprised of water pumped to waste from production wells, lost to

leaks, system flushing, and from meter inaccuracies. With a 2008 baseline, unaccounted use is projected to increase in proportion with increases in municipal production.

2.5.3 Water Supply

JBWD currently has two sources of water supply – groundwater and return flow from pumped ground water not consumptively used. In the near future, they plan to add a third source which is the State Water Project (SWP) imported water via MWA. In the projection model, the SWP supply is expressed as an annual average, although this source of supply can vary significantly from year to year. SWP imports are planned to recharge the groundwater basins; therefore, water management practices render the annual fluctuations in these sources of supply relatively unimportant for water supply planning.

Return flow is calculated as a percent of the water production for each water use category, per the methodology outlined in the MWA "Watermaster Consumptive Water Use Study and Update of Production Safe Yield Calculations for the Mojave Basin Area" completed by Webb Associates in February 2000 (2000 MWA Consumptive Use Study). Return flow factors for each category per the Study are explained below.

All municipal uses (SFR, MFR, CII, Unaccounted, and Other) are assigned a return flow value of 50 percent of production.

Table 2-6 summarizes JBWD's projected water demands through 2035, with and without conservation using the SBX7-7 requirements discussed previously in Section 2.4. Please note that JBWD's demand projections are the same with and without conservation.

TABLE 2-6
PROJECTED WATER DEMANDS

	2005	2010	2015	2020	2025	2030	2035
Water Demands[(a)] (af)	1,600	1,560	1,877	1,944	2,022	2,099	2,177
GPCD[(b)] (No Conservation)	153	140	160	156	156	156	156
SBX7-7 Req'd GPCD[(c)]	N/A	165	160	156	156	156	156
SBX7-7 Savings[(d)] (af)	N/A	0	0	0	0	0	0
Water Demands w/ Conservation[(e)]	N/A	1,560	1,877	1,944	2,022	2,099	2,177

Source is water production report from JBWD in calendar years and MWA's 2010 demand model forecast.

Notes:

(a) JBWD's demand projections without conservation.
(b) Calculated using the estimated population from Table 2-2.
(c) See Table 2-5.
(d) Calculated as the difference between the projected GPCD without conservation and the SBX7-7 Required GPCD times the population.
(e) JBWD's demand projections with conservation using the SBX7-7 requirements. Please note that the demands are the same with and without conservation. Also, 2010 data is actual.

Table 2-7 present the current, and projected water deliveries by customer type for JBWD.

TABLE 2-7
CURRENT AND PROJECTED WATER DELIVERIES (BY CUSTOMER TYPE) (AF)

Water Use Sector[(a)]	2005	2010	2015	2020	2025	2030	2035
Metered Single-Family	1,184	1,213	1,512	1,552	1,613	1,673	1,733
Metered Multi-Family	58	84	88	94	97	100	105
Metered Comm/Ind	161	244	258	278	291	304	317
Metered Irrigation	0	0	0	0	0	0	0
Metered Other	0	10	10	11	12	12	12
Unaccounted For/System Losses	197	9	9	9	9	10	10
Total	**1,600**	**1,560**	**1,877**	**1,944**	**2,022**	**2,099**	**2,177**

Source is MWA's 2010 demand model forecast and 2010 deliveries are actual. Also, JBWD's demand projections are the same with and without conservation.

2.5.3.1 Low Income Projected Water Demands

Senate Bill 1087 requires that water use projections of a UWMP include the projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county in the service area of the supplier. The County of San Bernardino's (County) 2007 General Plan last updated its housing element in April 12, 2007. Also, the Draft Joshua Tree Community Plan updated in February 2007 was reviewed. The County's housing element identifies the number (up to the year 2008) and specifies general locations of low income households in the County/Community of Joshua Tree. However, the housing element does not project the number or location of low-income households in the future. For this reason, it is not possible to project water use for lower income households separate from overall residential demand. However, the County will not deny or condition approval of water services, or reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one of the following occurs:

- the City/County specifically finds that it does not have sufficient water supply,
- the City/County is subject to a compliance order issued by the State Department of Health Services that prohibits new water connections, or
- the applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

2.6 Other Factors Affecting Water Usage

A major factor that affects water usage is typically weather. Historically, when the weather is hot and dry, water usage increases. The amount of increase varies according to the number of consecutive years of hot, dry weather and the conservation activities imposed. During cool, wet years, historical water usage has decreased, reflecting less water usage for exterior landscaping. This factor is discussed below in detail.

2.6.1 Weather Effects on Water Usage

California faces the prospect of significant water management challenges due to a variety of issues including population growth, regulatory restrictions and climate change. Climate change is of special concern because of the range of possibilities and their potential impacts on essential operations, particularly operations of the State Water Project. The most likely scenarios involve accelerated sea level rise and increased temperatures, which will reduce the Sierra Nevada snowpack and shift more runoff to winter months. These changes can cause major problems for the maintenance of the present water export system through the fragile levee system of the Sacramento-San Joaquin Delta. The other much-discussed climate scenario or impact is an increase in precipitation variability, with more extreme drought and flood events posing additional challenges to water managers[2].

These changes to the SWP water supply would impact JBWD when the District completes the infrastructure required to access its entitlement through the Morongo Pipeline. Climate change would affect how much SWP water is available, when it is available, how it can be captured and how it is used due to changes in priorities. Expected impacts to the SWP imported water supply include pumping less water south of the Delta due to reduced supply, and pumping more local groundwater to augment reductions in surface water supplies and reliability issues since groundwater is a more reliable source of water.

Historically, JBWD's single-family sector use has fluctuated from 113 to 135 gpcd, as shown on Figure 2-2. Between the years 2004 and 2005, there was a large drop in the number of SFR meters that has not recovered at this time. While historically this variation in range of water use could be primarily due to seasonal weather variations, with the unusual economic events of recent years and the effects of conservation, weather may have had little impact on the drop in usage for single family users.

2.6.2 Conservation Effects on Water Usage

In recent years, water conservation has become an increasingly important factor in water supply planning in California. Since the 2005 UWMP there have been a number of regulatory changes related to conservation including new standards for plumbing fixtures, a new landscape ordinance, a state universal retrofit ordinance, new Green Building standards, demand reduction goals and more.

In 2003, JBWD, MWA, and other retail water purveyors in the MWA Service Area formed the AWAC. The mission of the AWAC, a coalition of 25 regional organizations, is to promote the efficient use of water and increase communities' awareness of conservation as an important tool to help ensure an adequate water supply. The AWAC have developed water conservation measures that include public information and education programs and had set a regional water use reduction goal of 15 percent gross per capita by 2015.

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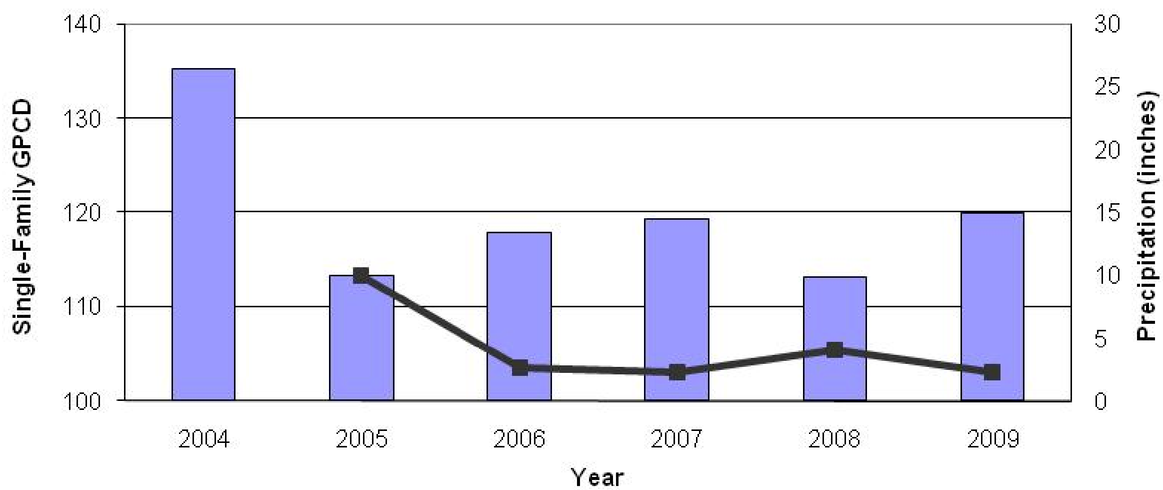
[2] Final California Water Plan Update 2009 Integrate Water Management: Bulletin 160.

Figure 2-2
Historical JBWD Single-Family GPCD



*Precipitation data is from http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KCAYUCCA6&graphspan=custom&month=1&day=1&year=2007&monthend=1&dayend=1&yearend=2008.

3.1 Overview

This section describes the water resources available to the Joshua Basin Water District (District, JBWD) for the 25-year period covered by the Plan. These are summarized in Table 3-1 and discussed in more detail below. Both currently available and planned supplies are discussed.

TABLE 3-1
SUMMARY OF CURRENT AND PLANNED WATER SUPPLIES (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Local Supplies						
Groundwater Production[(a)]	984	98	127	179	211	263
Return Flow[(b)]	576	604	642	668	693	719
Total Existing Supplies	**1,560**	**702**	**769**	**847**	**904**	**982**
Planned Supplies						
Basin Recharge Project - MWA Imported[(c)]	0	1,175	1,175	1,175	1,195[(d)]	1,195
Total Supplies	**1,560**	**1,877**	**1,944**	**2,022**	**2,099**	**2,177**

Note:
(a) See Section 3.2.1. Assumes that any reduction in production of groundwater will go directly to assisting the overdrafted groundwater basin.
(b) The return flow projections are discussed in Section 3.2.2 and are calculated from MWA's demand forecast model as (60 gallons per capita per day x JBWD population x 86%).
(c) See Section 3.3. MWA supply is assumed to be 60 percent of the 1,959 acre-feet per year (afy) entitlement. After 2022, MWA supply assumed to be from SWP imported water.
(d) See Section 3.3.3. Assumes MWA will continue supply of 1,959 afy to the Morongo Basin Pipeline.

The JBWD currently has two sources of local water supply – groundwater and return flow from the pumped groundwater not consumptively used. The portion of the groundwater pumped that does not return to the aquifer is referred to as consumptive use. Because in the near future JBWD will add a third supply, which will be the MWA supply of SWP imported water to recharge the groundwater basin, that wholesale supply is also discussed in the following sections.

3.2 Local Water Supplies

3.2.1 Groundwater

This section presents information about JBWD's groundwater supplies, including a discussion of the objectives from the adopted 1996 "JBWD Groundwater Management Plan" (GWMP) (1996 GWMP). Also, included is a discussion of the "Groundwater Availability Evaluation Joshua Basin Water District" completed in 2006 by Dudek & Associates (2006 GWMP Update), which evaluated the affects of future pumping by JBWD on the groundwater basin using the United States Geological Survey (USGS) developed groundwater numerical model.

3.2.1.1 Groundwater Basin Description

The JBWD service area overlies all or a portion of two groundwater basins as defined by the California Department of Water Resources (DWR) Bulletin 118-03 (DWR 2003). These basins - the Copper Mountain and the Joshua Tree Groundwater Basins - overlie a broad hydrologic region also defined in DWR Bulletin 118-03 as the Colorado River (region 7) hydrologic region and are listed in Table 3-2. Figure 3-1 shows the DWR groundwater basins in the JBWD service area.

TABLE 3-2
DWR GROUNDWATER BASINS

DWR Basin	Groundwater Basin	Budget Type[(a)]
7-11	Copper Mountain Valley (Copper Mountain)	A
7-62	Joshua Tree	A

Source: DWR
Note: (a) Type A – either a groundwater budget or model exists, or actual extraction data is available.

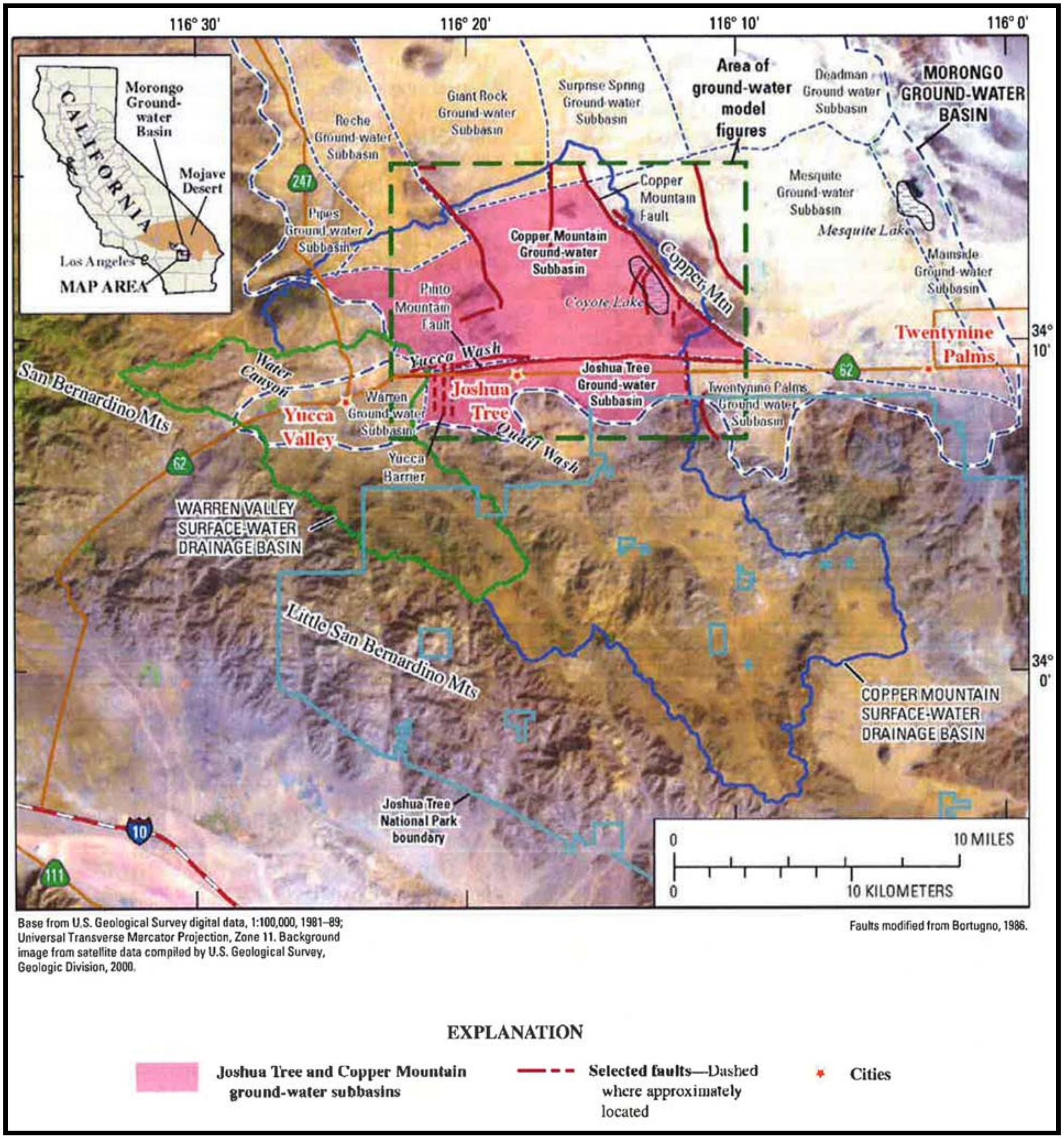
The JBWD supplies water to the community of Joshua Tree from the underlying Joshua Tree and Copper Mountain groundwater basins. The JBWD is concerned with the long-term sustainability of the underlying aquifer in the Joshua Tree basin and has recently constructed production wells in the adjacent Copper Mountain groundwater basin to help meet future demands.

The USGS conducted investigations on groundwater recharge and prepared a finite-difference numerical groundwater model for the JBWD in 2003-4 (Nishikawa et al., 2004). The results of the USGS study indicated that there are three aquifer zones in the Joshua Tree and Copper Mountain basins, but that, in general, the uppermost aquifer zone is the most permeable and has the best water quality. All of JBWD's supply wells are located in the uppermost aquifer.

Groundwater production from the basins has averaged approximately 1,660 afy from 2000-2008 from JBWD. The Joshua Tree basin is in a condition of substantial overdraft. The USGS study concluded that it takes approximately 300 years for the intermittent rainfall typical of the area to infiltrate through arroyo bottoms and reach the water table. However, it is likely the more continuous discharges to septic leach fields reach the groundwater table more rapidly than natural recharge along the arroyo bottoms. The report also presents data demonstrating that the groundwater in the deepest aquifer zone contains arsenic and hexavalent chromium.

The JBWD currently has five (5) water producing wells including Nos. 10, 14, 15, 16. 17. Two of these (Nos. 15 and 16) are in the Copper Mountain basin. The other three as well as the proposed recharge basins are located within the Joshua Tree basin.

FIGURE 3-1
JBWD GROUNDWATER BASINS



3.2.1.2 Adopted Groundwater Management Plan

The California State Legislature passed Assembly Bill 3030 (AB 3030) during the 1992 legislative session allowing local agencies to develop Groundwater Management Plans (GWMPs). The legislation declares that groundwater is a valuable resource that should be carefully managed to ensure its safe production and quality. The legislation also encourages local agencies to work cooperatively to manage groundwater resources within their jurisdiction. Senate Bill 1938 (SB 1938) was passed by the Legislature September 16, 2002 and made changes and additions to sections of the Water Code created by AB 3030.

The District's 1996 GWMP, adopted on February 17, 1997 by Ordinance 97-1, serves as the GWMP for JBWD because it contains all the relevant components related to Groundwater Management Plans in California Water Code Sections 10750-10753.10., as well as the components recommended by DWR in California's Groundwater, Bulletin 118. The GWMP is attached as Appendix C. In 2006, the District prepared a Groundwater Availability Evaluation (2006 Dudek Study), which evaluated the 2004 USGS Evaluation completed by Nishikawa, Izbicki et al. in cooperation with JBWD (USGS Nishikawa et al., 2004). The 2006 Dudek Study shows water needs under various growth scenarios. It was informational and was not adopted as a plan.

As discussed previously, JBWD is presently reliant upon groundwater for all of its water supply requirements. While the District overlies a significant supply of high quality groundwater, the region's arid environment limits the extent to which the groundwater supply is recharged. Since about 1980, the amount of groundwater extracted has exceeded the estimated amount recharged, leading to a condition known as overdraft. Limited or short-term overdraft is not considered a significant threat; however, excessive overdraft can result in significant problems, such as storage capacity reduction, groundwater quality reductions, and even ground surface subsidence. The purpose of the GWMP is to enable the District to manage the area's groundwater supply in a manner that avoids excessive overdraft while simultaneously continuing to provide the present and future residents of its service area with a safe and reliable water supply.

Neither the Joshua Tree nor the Copper Mountain groundwater basin is an adjudicated basin and, as such, there are no deeded rights to withdraw water. Overall management of water resources is the responsibility of the District. The District's 1996 GWMP describes the groundwater basin in detail, and the 2006 Dudek Study estimates existing and future groundwater production rates.

In order to accomplish the overall objective of the GWMP, the District established a number of subsidiary objectives which, when realized, will enable the District to effectively manage groundwater supplies. The District's Management Plan consisted of evaluating and (potentially) adopting a number of management activities, including water conservation measures, groundwater monitoring, groundwater production standards, water export prevention, conjunctive use, groundwater contamination prevention/response, planning agency coordination, and a replenishment assessment.

3.2.1.3 Copper Mountain/Joshua Tree Basins

The groundwater basins within the District's service area are bounded by the Ord and Granite Mountains to the north, the Bullion Mountains to the east, the San Bernardino Mountains to the southwest, and the Pinto and Little San Bernardino Mountains to the south.

The groundwater basins are comprised of non-water bearing rock which forms the boundary of the Joshua and Copper Mountain basins. Alluvial sediments including sand, gravel, silt, and clay fill the basins. The depth to crystalline rock comprising the boundaries is estimated by extrapolating between well borings that encounter crystalline rock and by geophysical techniques including gravity anomaly surveys. The porosity of the alluvium is the open spaces between individual grains of sand. Porosity can vary from 15 percent of the total volume of sediment in gravel to 55 percent in clay. Below the water table, the porosity is filled with water.

Specific yield is the term for the amount of water that is released from storage per unit area of aquifer per unit decline in the water table. That is, the amount of water that will drain from an unconfined aquifer as the water table declines. Not all the water filling the porosity will drain. Water touching the grains of the sediment is held in place by electrostatic forces and will not completely drain. Specific yield can range from 0.01 to 0.30. (JBWD, 2005 UWMP)

3.2.1.4 Available Groundwater Supplies

Recent historical and projected groundwater pumping for the JBWD service area is summarized in Tables 3-3 and 3-4.

TABLE 3-3
JBWD HISTORICAL GROUNDWATER PRODUCTION (AFY)

	2005	2006	2007	2008	2009
JBWD	1,600	1,786	1,875	1,515	1,690

Source: DWR PWSS Reports by JBWD.

TABLE 3-4
JBWD PROJECTED GROUNDWATER PRODUCTION (AFY)

	2010	2015	2020	2025	2030	2035
JBWD	1,560	1,877	1,944	2,022	2,099	2,177

Note: (a) Groundwater production projections are based on the GPCD remaining at the 2008 level (129 GPCD) of total production projections in the MWA forecast model.

To assist with the Joshua Tree subbasin overdraft, the Joshua Basin Recharge Project (see Section 3.3) will create a mechanism for JBWD to make use of MWA imported water via the Morongo Basin Pipeline. Currently, JBWD has an agreement in place with MWA in which JBWD is entitled to up to 1,959 afy of SWP water via the Morongo Basin Pipeline, which they cannot access without the extension of the Morongo Pipeline and construction of recharge facilities that would occur under the proposed Project. The Joshua Basin Recharge Project provides needed recharge into the Joshua Tree subbasin to relieve overdraft conditions.

Table 3-5 summarizes the net average annual water supply estimates for each of the basins that comprise the JBWD service area. The net average water yield of the entire JBWD service area is about 200 afy as documented in the 2004 USGS Nishikawa et al. Evaluation completed in cooperation with JBWD. This number generally represents the safe or perennial yield of the basins based on varying levels of data as summarized below.

The perennial yields described above are maintained for both a single dry year and multiple dry year scenarios in Table 3-5. Although recharge to the groundwater basin is typically less during dry years, the perennial yield values account for the transient nature of recharge in the groundwater system. Due to the time lag associated between recharge and change in groundwater storage near supply wells, these basins are considered reliable in both dry and wet years if long-term overdraft is avoided.

TABLE 3-5
JOSHUA TREE/COPPER MOUNTAIN GROUNDWATER BASINS
SUPPLY RELIABILITY

Anticipated Supply	Normal Year (afy)	Single-Dry Water Year (afy)	Multiple Dry Water Year (afy)
Joshua Tree/Copper Mountain[(a)]	200	200	200

Note: (a) USGS Nishikawa et al., 2004.

Adequacy of Supply

Until the connection to the Morongo Basin Pipeline is completed (Section 3.3), potable water for the community of Joshua Tree area is supplied entirely by groundwater and return flow not consumptively used. Recent studies conducted by the USGS in 2003-04 have concluded that about 1,600 afy of groundwater is pumped from the underlying basin (Joshua Tree basin). With an inflow estimated at approximately 1,200 afy, the Joshua Tree basin is currently overdrafted each year by approximately 400 acre-feet (af). The proposed recharge basins have been designed to achieve an annual average recharge of approximately 2,000 afy, which is more than what is required to replace the amount that is pumped from the groundwater basin on an annual basis. (JBWD Draft EIR, 2009).

Sustainability

For the Joshua Tree/Copper Mountain groundwater basins, ongoing implementation of the proposed Basin Recharge Project and the GWMP will ensure sustainability in the area.

3.2.2 Return Flow

A portion of the water pumped from the ground is returned to the groundwater aquifer and becomes part of the available water supply; this is defined as the return flow. For example, much of the water applied to septic systems and irrigation percolates back to the groundwater aquifer. The portion of the groundwater pumped that does not return to the aquifer is referred to as consumptive use.

Return flow shown in Table 3-1 is calculated as (60 gallons per capita per day GPCD) x (JBWD population) x (86%), as estimated in MWA's computer forecast model. Return flow factors were explained previously in Chapter 2 and averaged approximately 50 percent of the production flow.

3.2.3 Potential Supply Inconsistency

Because water use within the JBWD service area is supplied entirely by groundwater, JBWD does not have any inconsistent water sources that cause reduced deliveries to users within the service area. A potential exception is areas where water quality could limit use as a potable supply. Wellhead treatment or provision of an alternative supply would be planned for these areas. While many of the sources that recharge the groundwater basin have high annual variability, including flows on the Mojave River and supplies from the State Water Project, the groundwater basins used within the JBWD service area are sufficiently large to allow for continued water use during dry periods without seriously hindering the water supply (JBWD 2005 UWMP). In addition, MWA recharge of SWP supplies into the local groundwater basins will augment and maintain overall groundwater supplies.

3.3 Planned Wholesale Water Supplies

3.3.1 Imported Water Supplies

Currently, JBWD has an agreement in place with MWA (called the Improvement District Morongo (IDM) agreement, discussed in Section 3.3.3), in which JBWD is entitled to up to 1,959 afy of SWP water until the year 2022, which they cannot access without the extension of the Morongo Pipeline and construction of planned recharge facilities. SWP water will be brought to the area via the 71-mile long Morongo Basin Pipeline (MBP), which conveys SWP water from the California Aqueduct in the Mojave River watershed to the Hi-Desert Water District (HDWD) and JBWD service areas. Voters approved the financing plan for the $54 million MBP project by more than a two-thirds vote in June 1990.

In 1991, when the IDM Agreement was signed by MWA and JBWD, MWA had a SWP Table A entitlement of 50,800 afy. Of this amount, one seventh (or 7,257 afy) was assigned to Division 2 Improvement District M, the designated service area for the MBP. JBWD was assigned 1,959 afy of this amount. The agreement provides that MWA may deliver additional SWP water to MBP project participants when water is available, subject to pipeline capacity. This may be delivered to the retail customers; however, there is no guaranteed contractual amount. The JBWD has a contract in place under the provisions of the MBP agreement for delivery until 2022. After 2022, JBWD will rely on MWA to provide the necessary imported water (see Section 3.3.3).

The Joshua Basin District Recharge and Pipeline Project will create a mechanism for the JBWD to make use of SWP water via the Morongo Basin Pipeline. The JBWD is part of Improvement District M and therefore is paying a share of the debt associated with the construction of the Morongo Pipeline facilities. The project is just beginning construction and is expected to provide recharge of 1,000 afy into the Joshua Tree Basin in 2012.

As part of its long-term groundwater management plan, the District will construct a new Water Recharge Facility (WRF). The WRF will provide the District with the ability to recharge its underlying groundwater basin at an average annual rate of 2,000 afy. (The maximum design rate is 4,000 afy; the average is 2,000 afy.) Raw water will be supplied to the WRF through a new 16-inch transmission pipeline (approximately 23,650 linear feet) connecting to the existing Mojave Water Agency Morongo Pipeline in the vicinity of Yucca Mesa Road and Barron Drive, located along the boundary of the District's service area. The WRF will be constructed on an approximate 30-acre parcel located one-quarter mile east of the intersection of Sunburst Street and Verbena Road, in Joshua Tree, California. As described above, water will come from the SWP through MWA.

The proposed WRF is to be comprised of four to six (actual number of basins to be determined based on final design) individual percolation basins, with associated flow control and on-site distribution facilities. The site will be landscaped and bermed. Appropriate security fencing and monitoring will be included, with remote monitoring through District's existing SCADA system. The percolation facilities will be designed to facilitate regular operation and maintenance of the WRF. The recharge site will have a monitoring well that has already been installed. Design of the site will provide drivable access around each pond, and provide protection for the monitoring well.

The pipeline will be located on the southerly boundary of the State Route 62 right-of-way, between Yucca Mesa Road and Sunset Road. The alignment will continue north in Sunset Road to Chollita Road, turning east along Chollita Road to Sunburst Street. Continuing north in Sunburst Street, the alignment turns east on Verbena Road, ending at the proposed Water Recharge Facility site at the terminus of Verbena Road.

The project is in final design and awaiting funding primarily from Proposition 84 and the federal government to construct the project. Construction is expected to take about a year, with completion expected in mid-2012 if funding of Proposition 84 funds are secured; later if other grant funds are needed.

SWP water that is to be delivered to the JBWD under the proposed project will provide some relief of the overdraft condition, eliminate ongoing overdraft by enabling the District to meet current water demands, and provide recharge water (the amount in excess of local demand).

The term "dry" is used throughout this chapter and in subsequent chapters concerning water resources and reliability as a measure of supply availability. As used in this Plan, dry years are those years when supplies are the lowest, which occurs primarily when precipitation is lower than the long-term average precipitation. The impact of low precipitation in a given year on a particular supply may differ based on how low the precipitation is, or whether the year follows a high-precipitation year or another low-precipitation year. For the Mojave Water Agency (MWA), which will be the wholesaler for JBWD of imported State Water Project (SWP), a low-precipitation year may or may not affect supplies, depending on how much water is in SWP storage at the beginning of the year. Also, dry conditions can differ geographically. For example, a dry year can be local to the JBWD service area (thereby affecting local groundwater replenishment and production), local to northern California (thereby affecting SWP water deliveries), or statewide (thereby affecting both local groundwater and the SWP). When the term "dry" is used in this Plan, statewide drought conditions are assumed, affecting both local groundwater and SWP supplies at the same time.

3.3.2 MWA Water Supply Reliability

In an effort to assess the impacts of these varying conditions on SWP supply reliability, the DWR issued its "State Water Project Delivery Reliability Report 2009" (2009 SWP) update in

August 2010. The Report assists SWP contractors in assessing the reliability of the SWP component of their overall supplies.

The updated analyses in the 2009 SWP Report indicate that the SWP, using existing facilities operated under current regulatory and operational constraints and future anticipated conditions, and with all contractors requesting delivery of their full Table A amounts in most years, could deliver 60 percent of Table A amounts on a long-term average basis.

The delivery percentages used for SWP imported water for each of the above conditions were taken from DWR's Report based on the 82-year average, 1977, and the 1931-1934 average, for the average year, single-dry year, and multiple-dry year conditions, respectively. The delivery percentages are detailed in Table 3-6 for JBWD's entitlement through MWA's imported SWP water.

TABLE 3-6
JBWD IMPORTED WATER SUPPLY RELIABILITY:
SINGLE-DRY YEAR AND MULTIPLE-DRY YEAR CONDITIONS

Wholesaler	Average/ Normal Year(a)	Single-Dry Year(b)	Multiple-Dry Year(c)
California State Water Project (SWP)			
2010			
% of Table A Amount Available	60%	7%	34%
Anticipated Deliveries (afy)	1,175	137	666
2030			
% of Table A Amount Available(d)	61%	11%	35%
Anticipated Deliveries (afy)	1,195	215	686

Notes:
(a) The percentages of Table A amount projected to be available are taken from Table 6.4 and 6.13 of DWR's State Water Project Delivery Reliability Report 2009 (August 2010). Supplies are calculated by multiplying JBWD's entitlement amount of 1,959 af by these percentages.
(b) Based on the worst case historic single dry year of 1977.
(c) Supplies shown are annual averages over four consecutive dry years, based on the worst-case historic four-year drought of 1931-1934.
(d) See Table 6.13 in DWR's SWP 2009 Report. After 2022, when the IDM agreement finishes, it is assumed that MWA will provide necessary supply to JBWD. Refer to Table 3-1 in Chapter 3.

The DWR analyses projected that the SWP deliveries during multiple-dry year periods could average about 34 to 35 percent of Table A amounts and could drop as low as 7 to 11 percent during an unusually dry single year. Table 3-6 summarizes the estimated SWP supply availability during a single-dry or critical year in 2010, as defined by the Sacramento River Index, the SWP will be able to supply an average of 137 afy to JBWD through MWA. Similarly in 2010, during a multiple-dry year period (1931-1934), JBWD's entitlement through the MWA supply is estimated at 666 afy.

The values shown in Table 3-6 cover the period 2009 – 2029 based on the DWR estimates at the 2009 level for the current conditions and at the 2029 level for future conditions. Therefore, in a single-dry or critical year in 2035, the SWP will be able to supply an average of 215 af to JBWD through MWA. Similarly in 2035, during a multiple-dry year period, JBWD's entitlement through MWA's SWP supply is estimated at 686 afy.

3.3.3 MWA Continued Supply After IDM Agreement

The supply listed in Table 3-1, assumes that MWA will continue to supply a percentage of the entitled 1,959 afy to the Morongo Basin Pipeline after JBWD's existing contract with MWA expires in 2022 (Appendix D). After the IDM Agreement has expired, MWA will allocate SWP water to meet customer demands in the IDM area in a manner consistent with its universally applied SWP allocation policies. It is reasonable to assume that policies will be similar to the allocation methods MWA has used during the last few years (i.e. shortages will be shared by all MWA customers during dry periods and SWP supplies allocated according to customers' proportionate share of historic deliveries).

MWA has done extensive research and analysis in preparation of regional water demand projections for its 2010 UWMP, and has collaborated with the Technical Advisory Committee (TAC) to the MWA and its participants, including participants in the IDM Agreement, throughout the development of the projections. Draft regional projections indicate that total water supplies available to MWA, including local supplies and imported supplies from the SWP, will be sufficient to meet total water demands beyond the year 2035.

Based upon the projections prepared for MWA's Draft 2010 UWMP, it is anticipated that SWP supplies available to MWA will be sufficient to meet customer demands for imported water supplies through the year 2035, if local groundwater storage programs are used to buffer against short-term reductions or disruptions in supply.

3.4 Transfers, Exchanges, and Groundwater Banking Programs

In addition to SWP water supplies and groundwater, MWA is currently exploring opportunities to purchase water supplies from other water agencies and sources. Transfers, exchanges, and groundwater banking programs, such as those described below, are important elements to enhancing the long-term reliability of the total mix of supplies currently available to meet the needs.

3.4.1 Transfers and Exchanges

An opportunity available to JBWD to increase water supplies is to participate in voluntary water transfer programs. Since the drought of 1987-1992, the concept of water transfer has evolved into a viable supplemental source to improve supply reliability. The initial concept for water transfers was codified into law in 1986 when the California Legislature adopted the "Katz" Law (California Water Code, Sections 1810-1814) and the Costa-Isenberg Water Transfer Law of 1986 (California Water Code, Sections 470, 475, 480-483). These laws help define parameters for water transfers and set up a variety of approaches through which water or water rights can be transferred among individuals or agencies.

According to the California Water Plan Update 2009, up to 27 million afy of water are delivered for agricultural use every year. Over half of this water use is in the Central Valley, and much of it is delivered by, or adjacent to, SWP and Central Valley Project (CVP) conveyance facilities. This proximity to existing water conveyance facilities could allow for the voluntary transfer of water to many urban areas, including JBWD, via the MWA and imported SWP. Such water transfers can involve water sales, conjunctive use and groundwater substitution, and water sharing and usually occur as a form of spot, option, or core transfers agreement. The costs of a water transfer would vary depending on the type, term, and location of the transfer. The most likely voluntary water transfer programs would probably involve the Sacramento or southern San Joaquin Valley areas.

One of the most important aspects of any resource planning process is flexibility. A flexible strategy minimizes unnecessary or redundant investments (or stranded costs). The voluntary purchase of water between willing sellers and buyers can be an effective means of achieving flexibility. However, not all water transfers have the same effectiveness in meeting resource needs. Through the resource planning process and ultimate implementation, several different types of water transfers could be undertaken.

3.4.2 Opportunities for Short and Long-Term Transfers and Exchanges

Since JBWD is a retailer within the MWA service area, its transfer and exchange opportunities are somewhat limited. However, MWA has, on behalf of JBWD and all its retailers, participated in significant SWP Table A transfers and exchanges, thus augmenting local water supplies. It is assumed that MWA will continue to participate in such programs.

3.4.3 Groundwater Banking Programs

With recent developments in conjunctive use and groundwater banking, significant opportunities exist to improve water supply reliability for JBWD. Conjunctive use is the coordinated operation of multiple water supplies to achieve improved supply reliability. Most conjunctive use concepts are based on storing groundwater supplies in times of surplus for use during dry periods and drought when surface water supplies would likely be reduced.

Groundwater banking programs involve storing available SWP surface water supplies during wet years in groundwater basins in, for example, the San Joaquin Valley. Water would be stored either directly by surface spreading or injection, or indirectly by supplying surface water to farmers for their use in lieu of their intended groundwater pumping. During water shortages, the stored water could be pumped out and conveyed through the California Aqueduct through MWA to JBWD as the banking partner, or used by the farmers in exchange for their surface water allocations, which would be delivered to JBWD via MWA as the banking partner through the California Aqueduct. Several conjunctive use and groundwater banking opportunities are available to JBWD.

MWA has its own conjunctive use program to take advantage of the fact that the available MWA SWP supply on average is still greater than the demand in the service area. MWA is able to store this water for future use when SWP supplies are not available. This activity also allows MWA to take advantage of wet year supplies because of the abundant groundwater storage available in the Basins. In 2006, MWA adopted a “Water Banking Policy” to guide the Agency in determining where water will be “banked”. Banking targets (maximums) were established for each groundwater basin where banking may occur under this Policy to prioritize where available water will be banked. The targets are generally based on the calculation of three times the non-agricultural water demand (production) within the Subarea.

As of January 2011, the nearby water agency HDWD had over 17,000 af of water banked in the Warren Valley groundwater basin, which was excess SWP that it had purchased from MWA. This is a good example of an option that is also available to JBWD once the Recharge and Pipeline Project is completed.

3.5 Development of Desalination

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[i]). JBWD has evaluated opportunities for using desalinated water in future supply options. However, at this time, none of the opportunities is practical or economically feasible for JBWD, and JBWD has no current plans to pursue them. Therefore, desalinated supplies are not included in the supply summaries in this Plan. However, should a future opportunity emerge for JBWD to consider development of desalination, these potential future supply opportunities are described in the following section, including opportunities for desalination of brackish water, groundwater, and seawater.

3.5.1 Opportunities for Brackish Water and/or Groundwater Desalination

As discussed in Chapter 5, the groundwater supplies in the JBWD service area are not considered brackish in nature, and desalination is not required. There are brackish supplies near the dry lakes but it is not practical to pump, treat and potentially induce migration of better quality water to the dry lake areas and potentially cause subsidence. However, JBWD and MWA (a SWP contractor) could team up with other SWP contractors and provide financial assistance in construction of other regional groundwater desalination facilities in exchange for SWP supplies. The desalinated water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to JBWD/MWA from the SWP contractor. A list summarizing the groundwater desalination plans of other SWP contractors is not available; however, JBWD would begin this planning effort should the need arise.

In addition, should an opportunity emerge with a local agency other than an SWP contractor, an exchange of SWP deliveries would most likely involve a third party, such as MWA. Most local groundwater desalination facilities would be projects implemented by other retailers of SWP contractors and, if an exchange program was implemented, would involve coordination and wheeling of water through the MWA contractor's facilities to JBWD.

3.5.2 Opportunities for Seawater Desalination

Because the District is not in a coastal area, it is neither practical nor economically feasible for JBWD to implement a seawater desalination program. However, similar to the brackish water and groundwater desalination opportunities described above, JBWD could provide financial assistance to other retailers and/or team with MWA to provide financial assistance in the construction of other retail water purveyor's seawater desalination facilities in exchange for SWP supplies.

Section 4: Potential Recycled Water

4.1 Wastewater

The San Bernardino Local Agency Formation Commission's (LAFCO's) January 2011 report stated that the Joshua Tree community area is located within the Colorado River Water Basin and regulated by the Colorado River Regional Water Quality Control Board (Regional Board). The regulating document for this region is the Water Quality Control Plan that was adopted by the Regional Board in 1993 and last amended in November 2002. The Regional Board is currently in the process of developing and updating various regulatory requirements concerning urban runoff, septic systems, groundwater and surface waters in their jurisdiction.

4.1.1 Wastewater Authorization

In response to the regional discharge requirements, in 2006 the District requested that the Commission authorize it to have the "Wastewater" function. In 2007 the Commission authorized the District the "Wastewater" function but limited the services of that function to operation of wastewater package treatment plants and planning and engineering related to regional wastewater service (LAFCO 3074). LAFCO staff and the Commission did not believe that the wastewater function and service should include the ability to operate a regional wastewater facility at that time. Further consideration by the Commission is required for the District to expand the services to include the actual provision of collection, treatment and disposal of wastewater.

The Regional Board has adopted waste discharge requirements which have resulted in the requirement for installation of package treatment plants for developments approved within the District's boundaries and in other areas under its jurisdiction. In 2009 the District adopted a Wastewater Treatment Strategy in order to plan for a long-term and regional approach to protecting the groundwater. The strategy identifies 7,000 parcels in one-third of the District (35 square miles), mostly along Twentynine Palms Highway, where densities are currently zoned at levels that requires new development to provide wastewater treatment.

The District actively provides retail water service to residential and commercial customers (no agricultural use is reported) and is authorized to operate wastewater package treatment plants that are limited to a specific area.

4.2 Wastewater Generated Within JBWD

In 2010, the District had approximately 4,500 water connections. The District's wastewater strategy does not require any current customers to connect to a wastewater system in the foreseeable future unless mandated by some other agency with authority such as the State of California or the Regional Board.

4.2.1 Planned Improvements and Expansions

Most new construction in the JBWD service area is spread throughout the District and not concentrated in a way that would enable economical use of a central wastewater treatment plant. Recognizing this, the District's wastewater strategy is to require new development with more than 15 equivalent dwelling units (edu's) within the wastewater zone to install package wastewater treatment plants that will be owned and operated by the District. The effluent from the package plants will be disposed of by percolation to the ground, similar to septic tanks. These package plants may be combined as newer ones are constructed. New development will also pay a capacity fee for a central wastewater treatment plant that will eventually be constructed when it is economically viable to do so. The wastewater zone comprises about 35 of the 96 square miles of the District boundaries. It is anticipated that current development will not be required to connect to a wastewater treatment plant unless mandated by future local, state, or federal requirements.

4.2.2 Source Water Flow

Within the JBWD service area, there is currently no recycled water source. The only potential source for recycled water would be wastewater flow from any new development in the JBWD service area that could be treated to become recycled water if and when JBWD constructs a central wastewater treatment plant. This is not likely to occur in the near future.

4.3 Recycled Water Demand

JBWD has no source of recycled water and has not developed plans for serving recycled water within their service area.

4.3.1 Potential Users

Potential recycled water demand has not yet been evaluated by JBWD at this time.

4.3.2 Methods to Encourage Recycled Water Use

If and when JBWD develops a future recycled water delivery system, methods to encourage recycled water use, such as financial incentives, will be analyzed at that time.

Section 5: Water Quality

5.1 Overview

The quality of any natural water is dynamic in nature. This is true for the State Water Project (SWP) water brought into the Morongo area via the Morongo Basin Pipeline. During periods of intense rainfall or snowmelt, routes of surface water movement are changed; new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over the course of a year. These same basic principles apply to groundwater. Depending on water depth, groundwater will pass through different layers of rock and sediment and leach different materials from those strata. Water quality is not a static feature of water, and these dynamic variables must be recognized.

Water quality regulations also change. This is the result of the discovery of new contaminants, changing understanding of the health effects of previously known as well as new contaminants, development of new analytical technology, and the introduction of new treatment technology. All retail water purveyors are subject to drinking water standards set by the U.S. Environmental Protection Agency (EPA) and the California Department of Public Health (CDPH). Joshua Basin Water District (JBWD, District) extracts water from groundwater basins for delivery. An annual Consumer Confidence Report (CCR) is provided to all residents who receive water from the District. That report includes detailed information about the results of quality testing of the water supplied during the preceding year (CCR, 2009).

Several state, regional and county agencies have jurisdiction and responsibility for monitoring water quality and contaminant sites. Programs administered by these agencies include basin management, waste regulation, contaminant cleanup, public outreach, and emergency spill response.

This section provides a general description of the water quality of both planned imported water and existing groundwater supplies. A discussion of potential water quality impacts on the reliability of these supplies is also provided.

5.2 Imported Water Quality

Because in the near future, JBWD will add an imported supply source, which will be the MWA supply of SWP imported water, that wholesale supply is discussed below.

MWA provides imported SWP water to its service area. The source of SWP water is rain and snow from the Sierra Nevada, Cascade, and Coastal mountain ranges. This water travels to the Sacramento-San Joaquin Delta, which is a network of natural and artificial channels and reclaimed islands at the confluence of the Sacramento and San Joaquin rivers. The Delta forms the eastern portion of the San Francisco estuary, receiving runoff from more than 40 percent of the state's land area. It is a low-lying region interlaced with hundreds of miles of waterways. From the Delta, the water is pumped into a series of canals and reservoirs, which provides water to urban and agricultural users throughout the San Francisco Bay Area and Central and Southern California. MWA receives SWP water at four locations off the aqueduct. The fourth and last turnout is known as the Morongo Siphon (or Antelope Siphon Turnout) and serves the Morongo Basin Pipeline which releases SWP water in the Mojave River near the City of Hesperia and Yucca Valley. In the near future, the Morongo Basin Pipeline will also release SWP water at Joshua Tree for recharge into the JBWD's groundwater basins.

One important property of SWP water is the mineral content. SWP water is generally low in dissolved minerals, such as calcium, magnesium, sodium, potassium, iron, manganese, nitrate, and sulfate. Most of these minerals do not have health based concerns. Nitrate is the main exception, as it has significant health effects for infants; however, the nitrate content of SWP water is very low. Also of significance is the chloride content. Although not a human health risk, chloride can have a negative impact on agricultural activities and regulatory compliance for local sanitation agencies. The chloride content of SWP water varies widely from well over 100 milligrams per liter (mg/L) to below 40 mg/L, depending on Delta conditions.

Data regarding the quantity and quality of SWP water delivered to the MWA service area is readily available from the California Department of Water Resources (DWR). Although the quality of SWP water varies seasonally, for the period between 2005 and 2009 the average total dissolved solids (TDS) concentration has been approximately 269 mg/L for the Morongo area.

5.3 Groundwater Quality

The District obtains its groundwater from five wells in the Joshua Tree and Copper Mountain groundwater subbasins, which currently meets all the regulatory requirements.

The JBWD prepared a Final Environmental Impact Report (Final EIR) for the Recharge Basin and Pipeline Project (Project) in September 2009 (Final EIR, 2009). From this report it was shown that the groundwater quality in the Joshua Tree subbasin is good and is a sodium bicarbonate type. With the exception of well odor, color, and turbidity, groundwater quality estimates were derived from well data on the United States Geological Survey (USGS) website. Total dissolved solids (TDS) concentrations ranged from 148 to 248 milligrams per liter (mg/L) and average about 180 mg/L.

5.4 Groundwater Protection

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high quality supply. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other agencies that have local or regional authority or programs. JBWD currently operates five (5) groundwater production wells. To increase its groundwater protection activities, JBWD has been taking the following actions.

5.4.1 Water Quality Monitoring

Since 1990, community water systems in California have been providing an Annual Water Quality Report to customers under regulations adopted in 1989 by the CDPH. However, the 1996 amendments to the Federal Safe Drinking Water Act and recently adopted federal regulations now require a "Consumer Confidence Report." In addition, California law now requires a similar report to consumers.

This report must contain information on the quality of water delivered by the system and characterize any risks from exposure to contaminants detected in the drinking water. Contaminant levels have previously had a MCL. The Federal Government has now established a Maximum Contaminant Level Goal (MCLG) for each constituent that has an MCL. The State of California is currently establishing their own Public Health Goal (PHG) for each of the same contaminants. Where the State has not yet set a PHG, the requirement levels noted in the tables on the following pages refer to the federal MCLG.

5.4.2 Wellhead Protection

Since California has not developed a wellhead protection program, the groundwater portion of the Drinking Water Source Assessment and Protection (DWSAP) Program serves as the wellhead protection program for the State since 1999. The Program consists of drinking water source assessment and source water protection elements. For example, activities such as inventory of possible contaminating activities (PCAs) and vulnerability analysis are part of a complete DWSAP that target protecting the water resources.

5.4.3 Identification and Destruction of Abandoned Wells

The presence of abandoned groundwater wells represents a potential hazard to the quality of the groundwater basin. Abandoned and improperly destroyed wells can act as conduits for contaminants to reach drinking water supplies. It is vital for the long-term protection of the basin that abandoned wells be located and destroyed.

While it is the landowner's responsibility to destroy an abandoned well, local water agencies should be proactive about making sure that abandoned wells are in fact destroyed. The destruction of abandoned groundwater wells should be performed in accordance with state standards. California Water Code Section 13750.5 requires that those responsible for the destruction of water wells possess a C-57 Water Well Contractor's License. Whenever a water well is destroyed, a report of completion must be filed with the California DWR within 60 days of the completion of the work. The San Bernardino County (County) Department of Public Health, Division of Environmental Health Services is responsible for permitting and inspecting construction and destruction of wells.

For all functional and abandoned wells, a "well site control zone," the area immediately surrounding the well alternatively referred to as the "wellhead," needs to be established. The purpose of this zone is to provide protection from vandalism, tampering, or other threats at the well site. The size of this zone can be determined by using a simple radius, or an equivalent area. The well site control zone should be managed to reduce the possibility of surface flows reaching the wellhead and traveling down the unprotected casing. CDPH recommends a minimum radius of 50 feet for well site control zones for all public water systems in the state. The Program applies to the abandoned wells as well as functional activities that could potentially lead to "source water contamination" according to EPA regulations.

5.4.4 Hazardous Materials Response

Currently, the local Fire Department handles responses to hazardous materials incidents.

5.5 Water Quality Impacts On Reliability

5.5.1 Groundwater

The quality of water dictates numerous management strategies a retail water purveyor will implement, including, but not limited to, the selection of raw water sources, treatment alternatives, blending options, and modifications to existing treatment facilities. Maintaining and utilizing high quality sources of water simplifies management strategies by increasing water supply alternatives, water supply reliability, and decreasing the cost of treatment. The source water supplies are of good quality for JBWD. Maintaining high quality source water allows for efficient management of water resources by minimizing costs.

Maintaining the quality of water supplies increases the reliability of each source by ensuring that deliveries are not interrupted due to water quality concerns. A direct result from the degradation of a water supply source is increased treatment cost before consumption. The poorer the quality of the source water, the greater the treatment cost. Groundwater may degrade in quality to the point that it is not economically feasible for treatment. In this scenario the degraded source water is taken off-line. This in turn can decrease water supply reliability by potentially decreasing the total supply and increasing demands on alternative water supplies.

Currently, water quality does not affect water supply reliability in the JBWD service area. Maintaining the current level of quality is vital to maintaining a reliable water supply.

A goal of the JBWD's monitoring program is to detect long-term changes in groundwater quality. This includes detection of poor quality water. By identifying poorer quality water, action can be taken to mitigate the causes of this poorer quality water to help maintain long-term water supply reliability.

Section 6: Reliability Planning

6.1 Overview

The Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the next twenty-five years in five year increments. The Act also requires an assessment for a single dry year and multiple dry years. This chapter presents the reliability assessment for Joshua Basin Water District's (JBWD's, District's) service area.

As stated in JBWD's mission statement, the goal of JBWD is to "*provide a high standard of water quality and … protect the water resources of the District.*" This Plan helps JBWD to achieve this goal even during dry periods based on a conservative water supply and demand assumptions over the next 25 years, as discussed in the following sections.

6.2 Reliability of Water Supplies

Each water supply source has its own reliability characteristics. In any given year, the variability in weather patterns around the state may affect the availability of supplies to the JBWD's service area differently. For example, from 2000 through 2002, southern California experienced dry conditions in all three years. During the same period, northern California experienced one dry year and two average years. Typically for water management in southern California local groundwater supplies are used to a greater extent when imported supplies are less available due to dry conditions in the north, and larger amounts of imported water supplies are used during periods when northern California has wetter conditions. This pattern of "conjunctive use" has been in effect since State Water Project (SWP) supplies first came to the Yucca Valley area in 1991 via the Morongo Basin Pipeline. SWP supplies have supplemented the overall supply of the nearby water agency Hi-Desert Water District (HDWD) since the pipeline was constructed but JBWD must complete construction of its Basin Recharge Project before it will be able to take advantage of the SWP supply. To date, JBWD still depends solely on local groundwater supplies.

To supplement these local groundwater supplies, JBWD contracted with the Mojave Water Agency (MWA), which has contracted with the California Department of Water Resources (DWR) for delivery of SWP water, providing an imported water supply to the Joshua Tree/Copper Mountain groundwater basins. While the variability in SWP supplies affects the ability of MWA to meet the overall water supply needs for the service area; for JBWD, the added SWP supply will be recharged into the groundwater basins in wet years and used in place of overdrafting the groundwater basins in dry years, thus providing needed stability to the overdrafted groundwater basins.

As discussed in Section 3.3 of this Plan, each SWP contractor's Water Supply Contract contains a Table A amount that identifies the maximum amount of water that contractor may request. However, the amount of SWP water actually allocated to contractors each year is dependent on a number of factors than can vary significantly from year to year. The primary factors affecting SWP supply availability include hydrologic conditions in northern California, the amount of water in SWP storage reservoirs at the beginning of the year, regulatory and operational constraints, and the total amount of water requested by the contractors. The availability of SWP supplies to MWA and the other SWP contractors is generally less than their full Table A amounts in many years and can be significantly less in very dry years.

DWR's "State Water Project Delivery Reliability Report 2009" (2009 SWP Reliability Report), issued in August 2010, assists SWP contractors in assessing the reliability of the SWP component of their overall supplies. The Report updates DWR's estimate of the current (2009) and future (2029) water delivery reliability of the SWP. The updated analysis shows that the primary component of the annual SWP deliveries (referred to as Table A deliveries) will be less under current and future conditions, when compared to the preceding report (SWP Delivery Reliability Report 2007).

In the 2009 Report, DWR presents the results of its analysis of the reliability of SWP supplies, based on model studies of SWP operations. In general, DWR model studies show the anticipated amount of SWP supply that would be available for a given SWP water demand, given an assumed set of physical facilities and operating constraints, based on 82 years of historic hydrology. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints. In these model studies, DWR assumed existing SWP facilities and operating constraints for both the 2009 and 2029 studies. The primary differences between the two studies are an increase in projected SWP contractor demands and an increase in projected upstream demands (which affects SWP supplies by reducing the amount of inflows available for the SWP). DWR presents the SWP delivery capability resulting from these studies as a percent of full contractor Table A amounts, which is 60 percent of Table A as the long-term average supply until 2029, and then 61 percent in 2029 and after. To estimate supply capability in intermediate years between 2009 and 2029, DWR interpolates between the results of those studies.

6.3 Average, Single-Dry, and Multiple-Dry Year Planning

Currently, the JBWD has two sources of local water supply –groundwater and return flow from the pumped groundwater not consumptively used. Because in the near future (construction is estimated to start within a year) JBWD will add a third supply, which will be SWP imported water, that wholesale supply is also discussed in the following sections.

These supplies are available to meet demands during average, single-dry, and multiple-dry years. The following sections elaborate on the different supplies available to JBWD during each of the various dry year conditions and what supplies can be expected. Each subsection will explain the criteria used for estimating single-dry and multiple dry supplies that are then used in the comparison tables in Section 6.4.

6.3.1 Local Supplies

The JBWD local water supplies include groundwater and return flow from pumped groundwater not consumptively used. The following subsections discuss how the estimates for each local supply source were derived for average, single-dry and multiple-dry year periods.

6.3.1.1 Groundwater

Once the planned recharge project is online in 2015, it is planned that the groundwater basin supply will be used very little so the overdraft condition of the basin can be improved and the recharged water can be used to replenish the groundwater to its natural state. Therefore in a normal/average year, less than 200 afy of supply is expected to be required from the groundwater basin, after 2015.

During dry years, if imported water is not available for recharging the groundwater basin, then the groundwater itself will have to be accessed for supply to meet the demand in those years until the SWP water is once again available. The amount of groundwater required during the dry years is a function of the total demands less the SWP supply and return flow supply.

6.3.1.2 Return Flow

As previously discussed in Section 3.2, the return flow is supplied from pumped groundwater not consumptively used, so while the primary source is groundwater, the return flow also includes any wastewater treated effluent discharged into the basin.

In both dry year conditions (single-dry year and multiple-dry years), the return flow supply is assumed to remain 100 percent available because the amount of pumped groundwater will be the same, whether the supply is from the groundwater or from the recharged water. The source will not affect how much water is returned to the basin. This source will remain constant.

6.3.2 Planned MWA Imported State Water Project Supply

For this Plan, the availability of SWP supplies to JBWD was estimated by multiplying JBWD's 1,959 afy of entitled water from MWA's Table A amount by the delivery percentages from DWR's 2009 SWP Reliability Report, as discussed previously in Section 3.3.[3]

The delivery percentages used for SWP imported water for each of the above conditions were taken from DWR's Report based on the 82-year average, 1977, and the 1931-1934 average, for the average year, single-dry year, and multiple-dry year conditions, respectively. The delivery percentages are detailed in Table 3-6 for JBWD.

After 2022, assumes that MWA will continue to supply of percentage of the entitled 1,959 afy to the Morongo Basin Pipeline after JBWD's existing contract with MWA expires. Using the SWP projections discussed in Table 3-6, this supply equates to 215 afy for single-dry year of available supply and 686 afy for a multiple-dry year available supply.

Although the 2009 Report presents an extremely conservative projection of SWP delivery reliability, particularly in light of events occurring since its release, because it is based on the most up-to-date modeling by DWR, it remains the best available information concerning the SWP for use in preparing this Plan.

[3] DWR allotted amounts for MWA are 60% of Table A as the long-term supply until 2029 and then 61% in 2029 and after.

6.4 Supply And Demand Comparisons

The available supplies and water demands for JBWD's service area were analyzed to assess the service area's ability to satisfy demands during three scenarios: an average water year, single-dry year, and multiple-dry years. The tables in this section present the supplies and demands for the various drought scenarios for the projected planning period of 2010-2035 in five year increments. Table 6-1 presents the base years for the development of water year data. Tables 6-2, 6-3, and 6-4 at the end of this section summarize, respectively, Average Water Year, Single-Dry Water Year, and Multiple-Dry Year supplies.

TABLE 6-1
BASIS OF WATER YEAR DATA

Water Year Type	Base Years	Historical Sequence
Average Water Year	Average	1922-2003
Single-Dry Water Year	1977	--
Multiple-Dry Water Years	1931-1934	--

6.4.1 Average Water Year

Table 6-2 summarizes JBWD's water supplies available to meet demands over the 25-year planning period during an average/normal year, and is 60 percent of Table A as the long-term average supply until 2029, and then 61 percent in 2029 and after. As presented in the table, JBWD's water supply is broken down into existing and planned water supply sources, including wholesale (imported) water and local supplies. Demands are shown with and without the effects of an assumed urban demand reduction (conservation) resulting from Senate Bill 7 of Special Extended Session 7 (SBX7-7) imposed reductions.

6.4.2 Single-Dry Year

The water supplies and demands for JBWD's service area over the 25-year planning period were analyzed in the event that a single-dry year occurs, similar to the drought that occurred in California in 1977. Table 6-3 summarizes the existing and planned supplies available to meet demands during a single-dry year. Demand during dry years was assumed to increase by 10 percent.

6.4.3 Multiple-Dry Year

The water supplies and demands for JBWD's service area over the 25-year planning period were analyzed in the event that a four-year multiple-dry year event occurs, similar to the drought that occurred during the years 1931 to 1934. Table 6-4 summarizes the existing and planned supplies available to meet demands during multiple-dry years. Demand during dry years was assumed to increase by 10 percent.

6.4.4 Summary of Comparisons

As shown in the analyses above, JBWD has adequate supplies to meet demands during average, single-dry, and multiple-dry years throughout the 20-year planning period. While during dry years, the groundwater basin will continue to be "overdrafted" to meet the supplies due to the lack of imported supplies being available to recharge the basin, the planned imported SWP supply will lessen and offset the "overdraft" as much as possible.

TABLE 6-2
PROJECTED AVERAGE/NORMAL YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Local Supplies[a]						
Groundwater Production[b]	984	98	127	179	211	263
Return Flow	576	604	642	668	693	719
Total Existing Supplies	**1,560**	**702**	**769**	**847**	**904**	**982**
Planned Supplies						
Basin Recharge Project - MWA Imported[a,c]	0	1,175	1,175	1,175	1,195[d]	1,195
Total Supplies	**1,560**	**1,877**	**1,944**	**2,022**	**2,099**	**2,177**
Total Adjusted Demand[e]	1,560	1,877	1,944	2,022	2,099	2,177

Notes:

(a) Taken from Chapter 3 Water Resources, Table 3-1.
(b) Assumes that any reduction in production of groundwater will go directly to assisting the overdrafted groundwater basin.
(c) Assumed to be on-line by 2015. After 2022, MWA supply assumed to be from SWP imported water.
(d) Assumes MWA will continue supply of 1,959 afy to the Morongo Basin Pipeline.
(e) Conservation is assumed in demands using SBX7-7. See Chapter 2 Water Use, Table 2-7. 2010 demands and supply are from actual data. The demands are the same with and without conservation because no conservation is required to meet the SBX7-7 requirements.

TABLE 6-3
PROJECTED SINGLE-DRY YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Local Supplies[(a)]						
Groundwater Production[(b)]	984	1,324	1,359	1,419	1,401	1,461
Return Flow	576	604	642	668	693	719
Total Existing Supplies	**1,560**	**1,928**	**2,001**	**2,087**	**2,094**	**2,180**
Planned Supplies						
Basin Recharge Project - MWA Imported[(a,c)]	0	137	137	137	215[(d)]	215
Total Supplies	**1,560**	**2,065**	**2,138**	**2,224**	**2,309**	**2,395**
Total Adjusted Demand[(e)]	1,560	2,065	2,138	2,224	2,309	2,395

Notes:
(a) Taken from Chapter 3 Water Resources, Table 3-1.
(b) Assumes that during dry years, less water will be recharged using MWA's imported water to assist with the overdrafted groundwater basin and more water will be used from groundwater to supply demands as needed until the recharge supply is available again.
(c) Assumed to be on-line by 2015. After 2022, JBWD supply assumed to be from MWA imported water.
(d) Assumes MWA will continue supply of 1,959 afy to the Morongo Basin Pipeline.
(e) Demands are assumed to increase by 10% during dry years. 2010 demands and supply are from actual data. Conservation is assumed in demands using SBX7-7. See Chapter 2 Water Use, Table 2-7. The demands are the same with and without conservation because no conservation is required to meet the SBX7-7 requirements.

TABLE 6-4
PROJECTED MULTIPLE-DRY YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source[(a)]	2010	2015	2020	2025	2030	2035
Existing Supplies						
Local Supplies[(b)]						
Groundwater Production[(c)]	984	795	830	890	930	990
Return Flow	576	604	642	668	693	719
Total Existing Supplies	**1,560**	**1,399**	**1,472**	**1,558**	**1,623**	**1,709**
Planned Supplies						
Basin Recharge Project - MWA Imported[(b,d)]	0	666	666	666	686[(e)]	686
Total Supplies	**1,560**	**2,065**	**2,138**	**2,224**	**2,309**	**2,395**
Total Adjusted Demand[(f)]	1,560	2,065	2,138	2,224	2,309	2,395

Notes:
(a) Supplies shown are annual averages over four consecutive dry years (unless otherwise noted).
(b) Taken from Chapter 3 Water Resources, Table 3-1.
(c) Assumes that during dry years, less water will be recharged using MWA's imported water to assist with the overdrafted groundwater basin and more water will be used from groundwater to supply demands as needed until the recharge supply is available again.
(d) Assumed to be on-line by 2015. After 2022, JBWD supply assumed to be from MWA imported water.
(e) Assumes MWA will continue supply of 1,959 afy to the Morongo Basin Pipeline.
(f) Demands are assumed to increase by 10% during dry years. 2010 demands and supply are from actual data. Conservation is assumed in demands using SBX7-7. See Chapter 2 Water Use, Table 2-7. The demands are the same with and without conservation because no conservation is required to meet the SBX7-7 requirements.

Section 7: Demand Management Measures

7.1 Demand Management

The District plans to continue to implement the traditional demand management measures (DMMs) described below while it explores other locally effective demand management programs as part of the Gallons per Capita per Day (gpcd) option.

7.1.1 DMM 1 – Residential Surveys

A Residential Assistance Checklist was developed and piloted in 2009 to customers who reported high water bills. It includes on-site interior and exterior leak detection, a landscape water survey, and provision of low flow showerheads, aerators and information as appropriate. Application forms for High-Efficiency clothes washer and Water Sense Specification toilet rebates and vouchers are distributed as part of the survey.

Additionally, survey forms are routinely distributed at public workshops and as part of the District's school education program to obtain current end-user information and facilitate water conservation planning. Table 7-1 summarizes the number of surveys completed by JBWD. A copy of the Residential Assistance Checklist is in Appendix E. Collectively these programs satisfy the requirements of DMM 1.

TABLE 7-1
JBWD DMM SUMMARY

DMM/ Section	Description	Qty in 2008	Qty in 2009	Qty in 2010	Annual Water Savings (AF)
7.1.1	Residential Surveys	48	6	53	
7.1.2	Residential Plumbing Retrofits (Showerhead, kitchen aerator, and bathroom aerator)	0	70	34	3.80
7.1.5	Large landscape conservation and incentives – Cash for Grass conversion $.50/SF provided by MWA	0	0	20,000 Square Feet	2.98
7.1.6	High Efficiency Washing Machine Rebates $175 rebate provided by AWAC	33	62	31	2.38
7.1.9	CII Programs – Commercial Audits	0	0	1	6.96
7.1.14	High Efficiency Toilet Vouchers/Rebates $165 voucher/rebate provided by AWAC	47/32	36/30	11/10	3.60/2.67*

Notes:
*Voucher/Rebate.

7.1.2 DMM 2 – Residential Plumbing Retrofit

The District's plumbing retrofit program has two components – a regulatory component and distribution of retrofit kits. JBWD Board Resolution No. 00-618 (Appendix F) has been in place since December 2000, and requires that new commercial and residential development and/or remodels subject to a building permit install low-water-use plumbing fixtures. The District plans to pursue expansion of the retrofit requirement for Water Account Assistance Program (WAAP) applicants upon sale of each existing home. Beginning in 2014, the California State law requires that homes be retrofitted upon sale.

Plumbing retrofit kits are distributed through the District's school education program which targets approximately 120 families of 5th and 6th-grade students per year. The kits include low flow showerheads, bathroom aerators, kitchen aerators, a drip gauge, toilet leak detector tablets, a flow rate test bag and supporting information. Table 7-1 summarizes the number of retrofits completed by JBWD.

7.1.3 DMM 3 – System Water Audits, Leak Detection and Repair

The District plans to fully implement the American Water Works Association (AWWA) M36 Standard Water Audit methodology in 2011. This approach consists of a component analysis of leaks into "revenue" and "non-revenue" categories, and an economic analysis of recoverable loss. The audits will be conducted annually in compliance with DMM 3.

7.1.4 DMM 4 – Metering with Commodity Rates for New Connections and Retrofit of Existing Connections

JBWD regulations include a mandatory hook-up policy for all new customers and the District has no unmetered service connections. All customers are billed monthly by volume of use.

The District has developed a meter census which it is modifying to better define the Commercial, Industrial, and Institutional (CII) customers through the use of a physical audit. The District replaced all meters in 1999 and 2000 and manufacturers' warranties are typically for a 20-year period. Meter testing has historically been performed in response to customer requests, but the District is developing a schedule to test large meters (2-inch diameter and larger) annually, along with a randomized sample of residential meters.

The District plans to study the feasibility of retrofitting mixed-use commercial accounts with dedicated landscape water meters. Dedicated landscape water meters have been required by County Ordinance for all projects with a landscape area equal to or greater than 5,000 square feet since February 2011. Single-family residential connections and certain commercial agricultural properties are exempt.

7.1.5 DMM 5 – Large Landscape Conservation Programs and Incentives

Large landscape facilities within the District's sphere of influence are limited to a few institutional properties and a local cemetery. While exempt from most requirements of the State's Water

Efficient Landscape Ordinance, the cemetery is interested in reducing landscape water use and the District has assisted them with a landscape irrigation audit and plans to offer requested turf removal incentives. The District plans to assist a community college facility (previously served by a private well) to reduce water use on an expansion of their property with the addition of sports fields and will offer similar assistance to other facilities if cost-effective. Table 7-1 summarizes the "Cash for Grass" conversion completed for users within JBWD service area.

Additionally, the District is working with regional partners to install a California Irrigation Management Information System (CIMIS) station that will provide evapotranspiration (ETo) information for the purpose of developing landscape water budgets and irrigation scheduling information. Currently the nearest CIMIS station is approximately 60 miles away.

7.1.6 DMM 6 – High Efficiency Washing Machine Rebate Program

The District has participated in the Mojave Water Agency's rebate program since it began in February 2008 and plans to continue to participate while funding is available. Table 7-1 summarizes the number of High Efficiency Washing Machine Rebates completed by JBWD.

7.1.7 DMM 7 – Public Information Programs

The District recognizes the continued need for a public information program to maintain and increase the public's awareness of water and the need to use it wisely. The District promotes water conservation to the public through its monthly *Waterline Reports*, new website with water conservation tips (http://www.jbwd.com/), the newly completed Water Wise Demonstration Gardens, Water Wise Landscape design templates, a variety of brochures, public workshops and speaking engagements.

7.1.8 DMM 8 – School Education Programs

The Board of Directors of the Joshua Basin Water District authorized District staff to initiate a School Education Program developed by the Resource Action Program in 2009. The program is offered to fifth and sixth grade instructors at Joshua Tree's two elementary schools, Joshua Tree Elementary and Friendly Hills and targets approximately 120 students.

The program provides tools for children to reduce the use of water (plus gas and electricity) at their homes and to measure the savings. Children in the 5th grade receive a kit containing a high efficiency showerhead, kitchen aerator, bathroom aerator, drip gauge, flow-rate test bag, and similar materials. Results are determined from survey forms and standard water savings estimates. A copy of the *JBWD WaterWise Program Summary Report 2009-2010* is included in Appendix E.

7.1.9 DMM 9 – Commercial, Industrial and Institutional (CII) Programs

The District's service area historically is a residential community with very few commercial and institutional customers. Recent residential and supporting commercial growth is very slowly changing the customer makeup and the District has initiated a survey program to facilitate planning for its CII program. Table 7-1 summarizes the commercial audits completed by JBWD.

The District has retained the services of a water efficiency consultant, The Bollinger Consulting Group, to assist in the development and implementation of these programs as they become economically feasible. Currently, commercial/industrial/institutional programs have been limited to incentive programs to retrofit with ultra low-flow toilets. Additionally the District is working with a local hospital to reduce water use through its cooling towers, and additional programs will be added as survey information is analyzed. Copies of the completed Water Use Surveys are included in Appendix E.

7.1.10 DMM 10 – Wholesale Assistance

The District will continue to work cooperatively with Mojave Water Agency to participate in regional DMM programs, informational groups and projects, determination of the most cost-effective DMMs, and tailoring programs specific to the District. Historically, those programs have included a Water Conservation Incentive Program (WCIP) offering rebates and vouchers for ultra-low flow toilets and washing machines, provision of low-flow nozzles and showerheads, and public education workshops and informational brochures. Many of these services are described in the Alliance for Water Awareness and Conservation website (http://www.hdawac.org/).

7.1.11 DMM 11 – Conservation Pricing

The District has meters for each customer and charges a volumetric rate for water use. In 2004, the District implemented a tiered rate structure that charges customers an increased price as water usage increases. This resolution, which was updated in 2007, is attached as Appendix G. By charging each customer a tiered rate for the volume of water used, the District encourages customers to reduce water use and therefore the amount paid for water. This rate system meets the DMM 11 requirements using the option 1 adequacy formula. The District is currently at 56% for year two of a phased implementation plan, and will incorporate the BMP requirements into a rate study scheduled for 2011. The District does not provide wastewater service; the service area relies on septic tanks and recently approved package treatment plants for wastewater disposal.

7.1.12 DMM 12 – Conservation Coordinator

This DMM consists of designating a water conservation coordinator among the staff of the District or hiring a new person or consultant to serve in that capacity. In general, it is felt that having a designated coordinator helps improve the effectiveness of a water agency's conservation efforts. Depending upon the scope of the program and size of the District, along with other staffing demands, these duties can be a part- or full-time responsibility.

In 2007, the District obtained the services of a water conservation consultant, Bollinger Consulting Group, to serve as an as-needed role for water conservation issues. Together with the General Manager and his staff, they work together to coordinate conservation programs and implementation, as well as communicate and promote water conservation issues to the District Board, local developers, and the community at large. The District's current sharing of these duties meets the requirements of DMM 12.

7.1.13 DMM 13 – Water Waste Prohibition

Joshua Basin Water District staff participated in the development of a regional Model Landscape Ordinance as part of the Alliance for Water Awareness and Conservation (AWAC) landscape committee. The Ordinance includes water waste prevention provisions for existing landscapes in Section 10, and Prohibited Water Uses and Water Waste in Section 12. While many provisions are intended to be applied to new development, JBWD is reliant on San Bernardino County to enforce the landscape ordinance through their permitting process. A new County ordinance with many similar provisions went into effect countywide in February 2011.

Additionally, the District's Urban Water Management Plan (UWMP) includes a Water Shortage Contingency Plan which includes specific use restrictions and prohibitions discussed in Section 8. The District is exploring further water waste prohibitions consistent with regional efforts. Collectively, these measures meet the requirements of DMM 13.

7.1.14 DMM 14 – Residential High Efficiency Toilet (HET) Replacement Programs

The District requires compliance with state regulations for water efficient devices in new construction, per the Uniform Building code. Retailers in California are generally required to provide only high water efficiency toilets and appliances.

In 2006, the Mojave Water Agency also implemented a High Efficiency Toilet (HET) Voucher program in the area. The program allows District customers to submit an application to the Mojave Water Agency to receive a voucher that can be used at local retailers, or to receive a rebate for purchase of conforming toilets. The District will continue to participate in the voucher/rebate program while funding is available. Table 7-1 summarizes the number of HET vouchers and rebates completed by users within JBWD's service area.

The District was exploring the addition of a retrofit requirement for re-sale of a residence, however, as previously noted; the State of California has enacted legislation to require retrofit upon sale in 2014. This program meets the requirements of DMM 14.

7.1.15 Additional Data

JBWD's Board of Directors directed the implementation of the DMMs in June 2009 and programs began that year with the exception of the AWAC funded rebate and voucher programs (BMPs 6 and 14), which began in 2007. Since then the District adopted the gpcd compliance option as previously reported. Supporting information is included in Appendix E.

7.1.15.1 Evaluating Effectiveness of the DMMs

JBWD monitors all conservation program activities continually, including public workshops and school education programs, rebate and fixture distribution programs, landscape and commercial audits and leak prevention. Program effectiveness is determined by monitoring the water use history of commercial and landscape customers and per capita water use of the general population. Cost effectiveness studies are completed or updated on an as-needed basis.

7.1.15.2 Impacts of Conservation

The District's current and future programs are expected to have a modest effect on water use in order to accomplish the 5 percent water savings goals for 2020. The District does not anticipate that current programs will negatively affect the District's ability to further reduce demand.

Section 8: Water Shortage Contingency Planning

8.1 Overview

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought which limits supplies, an earthquake which damages water delivery or storage facilities, a regional power outage, or a toxic spill that affects water quality. This chapter of the Plan describes how Joshua Basin Water District (JBWD, District) plans to respond to such emergencies so that emergency needs are met promptly and equitably.

The JBWD has developed a four-stage plan as detailed in their 2005 UWMP, for responding to water shortages. The Water Shortage Plan includes voluntary and mandatory stages to address a reduction in water supply that exceeds 60 percent (Appendix H). Prohibitions, penalties and financial impacts of shortages have been developed by JBWD and are summarized in this chapter.

8.2 Coordinated Planning

Although JBWD has an entitlement to the State Water Project (SWP) imported water through its contractor Mojave Water Agency (MWA), the infrastructure required to access this supply is not yet in place. As of the writing of this Plan, grant funding to begin the construction of the necessary infrastructure is still on hold. During past water shortages, JBWD has managed to meet all their demands by pumping groundwater only. When JBWD obtains access to MWA's imported water in the near future, the existing water shortage contingency procedures will be modified. Also, JBWD has a temporary tie-in to the Hi-Desert Water District (HDWD) for emergency situations.

8.3 Stages of Action to Respond to Water Shortages

JBWD is situated above the Copper Mountain and Joshua Tree groundwater basins. Together, the groundwater basins contain over 600,000 acre-feet (af) of water.[4] JBWD's sole source of water is groundwater from these two basins. The basins are not adjudicated; for that reason there are no deeded rights to withdraw water. Overall management of water resources is the responsibility of JBWD.

Rationing stages may be triggered by a shortage in aquifer supply, equipment failure, or catastrophe. Shortages may trigger staged allocation limits at any time. JBWD's General Manager classifies each customer and calculates each customer's allotment according to the methods described in the Water Shortage Contingency Plan. The allotments reflect seasonal patterns. Customers are notified of their classification and allotment by mail before the effective date of the Water Shortage Emergency. New customers and connections are notified at the time service commences. In a disaster, prior notice of allotment may not be possible. In such cases, notice may be provided by other means, such as telephone, radio, television, or newspaper.

[4] JBWD *2006 Groundwater Availability Evaluation*, prepared by Dudek.

Customers may appeal the General Manager's classification on the basis of use or the allotment on the basis of incorrect calculation. The appeals process is set forth in Appendix H.

Table 8-1 presents the four-stage rationing and demand reduction goals for JBWD.

TABLE 8-1
RATIONING AND REDUCTION GOALS

Deficiency	Stage	Demand Reduction Goal	Type of Program
25-40%	1	10% reduction	Voluntary
40-50%	2	15% reduction	Voluntary
50-60%	3	20% reduction	Mandatory
Greater than 60%	4	25% reduction	Mandatory

District priorities for use of available water during a water shortage are:

- Fire protection, health, and welfare emergency uses
- Domestic-interior uses only (residential)
- Public buildings, school-interior uses only
- Commercial and Industrial-interior use only
- Health and Safety—Interior residential, sanitation and fire protection
- Commercial, Industrial, and Governmental—Maintain jobs and economic base
- Commercial and Industrial-other uses (not including landscape watering or other nonessential uses)
- Domestic-other uses

8.4 Minimum Water Supply Available During Next Three Years

The minimum water supply available during the next three years would occur during a three-year multiple-dry year event between the years 2011 and 2013. JBWD is actively implementing a conjunctive use program utilizing State Water Project water to recharge local aquifers, however since the date of federal funding commencing for the program is unknown at the time this Plan was written, to be conservative, that program has not been included in the supply table below. As shown in Table 8-2, the total supplies range from approximately 1,880 to 2,080 afy during the next three years. It is assumed that the total water demand remaining the same as during normal years. When comparing these supplies to the demand projections provided in Chapters 2 and 5 of this Plan, JBWD will continue to overdraft the underlying groundwater basins to meet projected demands should a multiple-dry year period occur during the three years, until their planned Basin Recharge Project is completed.

TABLE 8-2
ESTIMATE OF MINIMUM SUPPLY FOR THE NEXT THREE YEARS

Source	Supply (afy)		
	2011	**2012**	**2013**
Existing Supplies			
Local Supply[a]			
Groundwater Production[b]	1,225	1,238	1,250
Return Flow	582	587	593
Total Existing Supplies	**1,807**	**1,825**	**1,843**
Planned Supplies			
Basin Recharge Project - MWA Imported[c]	0	0	0
Total Supplies	***1,807***	***1,825***	***1,843***
Total Estimated Demands[d]	1,807	1,825	1,843

Notes:
(a) Taken from Chapter 3 Water Resources, Table 3-1. Local supplies are assumed to be 100% available.
(b) Overdrafting of Joshua Tree/Copper Mountain groundwater basins is assumed to occur here as is currently the case in the basin.
(c) Due to the unknown Federal funding date, the worst case scenario was used in this table and it is assumed that this project is not completed in the next three years.
(d) See Chapter 2 Water Use, Table 2-7. Please note that the demands are the same with and without conservation.

8.5 Actions to Prepare for Catastrophic Interruption

8.5.1 General

The groundwater basins in the District's area are the limiting factor in groundwater production, but are expected to continue to produce reliable supplies even in a catastrophe.

Water stored in the District's distribution system storage tanks are monitored and managed to not allow the reservoir volumes to drop to very low levels. Standard practice is to maintain, at a minimum, the required emergency and fire flow within all tanks at all times. In an emergency, these stored water volumes are available for distribution or truck delivery as necessary.

The District is constructing a distribution site where customers will be able to fill containers with water for drinking. A hauling site for recreational vehicles (RV's) or water trucks is available for larger tanks. The District frequently provides bottled drinking water to individuals who are not able to secure water.

8.5.2 Regional Power Outage Scenarios

For a major emergency such as an earthquake, Southern California Edison (Edison) has declared that in the event of an outage, power would be restored within a 24 hour period. Following the Northridge earthquake, Edison was able to restore power within 19 hours. Edison experienced extensive damage to several key power stations, yet was still able to recover within a 24-hour timeframe.

JBWD is committed to providing regular service and meeting the needs of the community during any emergency situation. JBWD is obligated to respond to emergencies by using all available resources in the most effective way possible. The District has an “Emergency Response Plan” revised in 2005 that includes guidelines for evaluating the emergency situation, alerting procedures and details of the different phases of the response.

To specifically address the concerns of water outages due to loss of power, JBWD has purchased two 600 kilowatt (kW) diesel generators to operate Well No. 14, the District’s largest well. Once Well No. 14 is operating, one of the generators can be relocated to a different well site. All active wells have connectors to enable the use of emergency generators. The District also has two 125 kW and one 150 kW mobile generators to operate booster pumps stations. Five of the nine booster pump stations have connectors. The remaining four are planned to have connectors.

8.6 Mandatory Prohibitions During Shortages

JBWD Board of Directors has adopted several ordinances, including provisions from the Alliance for Water Awareness and Conservation (AWAC), aimed at water conservation and outlawing wasteful water practices.

On January 10, 2007, the JBWD Board of Directors adopted Resolution 07-806 (Appendix G), the current rate structure for service charges.

Board Resolution No. 00-618 has been in place since December 2000 and requires that new commercial and residential development and/or remodels subject to a building permit install low-water-use plumbing fixtures. The District plans to pursue expansion of the retrofit requirement for Water Account Assistance Program (WAAP) applicants and upon sale of each existing home.

JBWD staff participated in the development of a regional Model Landscape Ordinance as part of the AWAC’s landscape committee. The ordinance includes water waste prevention provisions for existing landscapes in Section 10, and Prohibited Water Uses and Water Waste in Section 12. While many provisions are intended to be applied to new development, JBWD is reliant on San Bernardino County (County) to enforce the landscape ordinance through their permitting process. A new County ordinance with many similar provisions went into effect countywide in February 2011.

8.7 Consumptive Reduction Methods During Restrictions

8.7.1 Supply Shortage Triggering Levels

JBWD will manage water supplies to minimize the social and economic impact of water shortages. The Water Shortage Plan is designed to provide a minimum 40 percent of normal supply during a severe or extended water shortage.

Demand reduction stages may be triggered by a shortage of water in the basin. The guidelines for triggering the stages are listed in Table 8-3. However, circumstances may arise where the

JBWD may deviate from these guidelines, such as in a case where the Governor declares a water shortage emergency and/or institutes a statewide rationing program.

TABLE 8-3
WATER DEFICIENCY TRIGGERING LEVELS

Stage	Percent Shortage
1	25 to 40 percent water deficiency
2	40 to 50 percent water deficiency
3	50 to 60 percent water deficiency
4	60+ percent water deficiency

8.7.2 Restrictions and Prohibitions

Specific use restrictions and prohibitions for each supply shortage stage taken from the District's 2005 UWMP are as follows:

Stage 1:

Prohibitions

- Elimination of hosing of hardscape surfaces, except where health and safety needs dictate.
- Usage of buckets and automatic hose shutoff devices for car washing and outside cleaning activities.
- Repair water leaks and adjust sprinklers to eliminate over-spray.

Other Activities

- The District shall notify customers of the shortage and indicate requested curtailments of use. Such notification shall provide avenues of additional information assisting customers in achieving requested conservation.

Stage 2:

Prohibitions

- Extend the voluntary requests from Stage 1.
- No landscape watering between 0800 and 1700 hours.
- New meters for land development restricted only to property owners of presently existing parcels.

Other Activities

- Initiate media campaign to educate the District customers of conservation needs.

Stage 3:

Prohibitions

- Voluntary requests from Stage 1 and 2 become mandatory.

- Issuance of construction water meters would cease and meters would only be installed for new accounts where the building permit was issued prior to the declaration of the water shortage.

Other Activities

- Mandatory use prohibitions will be enforced through water patrol personnel.

Stage 4:

Prohibitions

- All prohibited actions in Stage 3 would be in force.
- No meters will be installed for new accounts.

8.7.3 Consumption Limits

Specific consumption reduction methods and anticipated reduction for each supply shortage stage are shown in Table 8-4.

TABLE 8-4
CONSUMPTION REDUCTION METHODS

Consumption Reduction Method	Projected Reduction	Implementation Stage
Irrigate lawns and landscape only between midnight and 6 a.m. (unless hand watering).	5% of external use	Voluntary Stage 1 Mandatory Stage 2
Adjust and operate all landscape irrigation systems in a manner that will maximize efficiency and avoid watering hardscape.	10% of external use	Voluntary Stage 1 Mandatory Stage 2
Reference evapotranspiration (ETo) factors for individual metered landscape projects will be reduced from 1.0 to 0.8.	20% of external use	Voluntary Stage 1 Mandatory Stage 2
Landscape meters to 75% of ETo.	25% of external use	Mandatory Stage 3
Landscape meters to 60% of ETo.	40% of external use	Mandatory Stage 4
Water used on a one-time basis for construction and dust control shall be limited to the quantity identified in a plan prepared (and submitted to the District for approval) by the user describing water use requirements.	Varies	Mandatory Stage 3
The use of water from fire hydrants shall be limited to fire fighting and related activities.	Varies	Mandatory Stage 3
Water for municipal purposes shall be limited to activities necessary to maintain public health, safety, and welfare.	Varies	Mandatory Stage 3
Outdoor irrigation by sprinklers will only be allowed every other day.	50% of external use	Mandatory Stage 3
Irrigation of landscaping is only allowed twice per week by hand-held hose only.	70% of external use	Mandatory Stage 4
All new landscaping shall be limited to drought tolerant plantings as determined by the District.	30% of external use for all new homes.	Mandatory Stage 4

Source is JBWD’s 2005 UWMP.

Service may be terminated to any customer who knowingly and willfully violates any of the provisions included in this chapter of the Plan.

In the event that a severe or critical water shortage occurs, the District will establish mandatory annual allotments for each connection based on average use during a three-year base period. The base period will be selected by the District's Water Shortage Response Team. The District-wide consumption allocation for each customer type is as follows:

The Stage 3 and Stage 4 health and safety allotments are roughly 68 gallons per capita per day (gpcd). These health and safety levels are used as a basis for water allocations using the priorities listed above. This provides sufficient water for essential interior use with no change in either water use habits or plumbing fixtures.

During Stages 3 and 4 of a water shortage, the District has developed specific water allotments by connection types as shown in Table 8-5. These allotments were developed using the California Water Code Stage 2, 3, and 4 health and safety allotments of 68 gpcd, or 33 hundred cubic feet (CCF) per person per year as the basis.

TABLE 8-5
STAGES 3 AND 4 WATER SHORTAGE ALLOTMENTS

Connection Type	Basis of Calculation	Maximum Annual Allotment
Single-Family Residential	68 gpcd x 3.1 persons x 365 days	103 CCF + 20% average annual use in excess of 103 CCF
Multi-Family	68 gpcd x 2.3 persons x 365 days	76 CCF + 20% average annual use in excess of 76 CCF
Commercial, Industrial		No more than 70% average annual use
Landscape		No more than 20% average annual use unless xeriscaped, then 70%
New meters		No new meters will be installed during a water shortage emergency.

Each customer will be notified of its classification and allotment by mail before the implementation of a mandatory program. New customers and connections will be notified at the time service commences if a mandatory program is in effect. Any customer may appeal its classification on the basis of use or the allotment on the basis of incorrect calculation.

In a disaster, prior notice of allotment may not be possible. Notice will be provided by the most efficient means available, if necessary, through the terms of the JBWD's Emergency Response Plan.

8.7.4 New Demand

During a Stage 3 water shortage emergency, issuance of construction water meters would cease and meters would only be installed for new accounts where the building permit was issued prior to the declaration of the water shortage. No meters will be installed for new accounts during a Stage 4 water shortage emergency.

8.8 Penalties For Excessive Use

During any declared water shortage emergency, a customer who exceeds the established allotment will pay a surcharge of two times the highest rate tier per CCF of water for excess water delivered during the first and second billing period, and a surcharge of four times the highest rate tier per CCF for excess water delivered during the third and subsequent consecutive billing periods.

If a customer exceeds the allotment usage for three consecutive billing periods, the District will install a flow restrictor at the service meter with a capacity of two gallons per minute (gpm) for meters up to one and one-half inch sizes (and comparatively sized restrictors for larger meters) for a period of seven days. The customer must pay a flow restrictor installation and removal charge of $100 before the normal service will be restored.

8.9 Financial Impacts Of Actions During Shortages

JBWD's rates are designed with the intent that JBWD will generate adequate revenues to meet the costs of operating the water system. For the 2010-11 budget year, it is expected that approximately 50 percent of JBWD's total water revenues will come from meter charges. The nature of JBWD's operation (as with any water utility) is that the majority of the operating costs are "fixed" in nature and do not increase or decrease in direct proportion with increases or decreases in water use by customers. If water availability issues or shortages cause JBWD to reduce the customer's water use, that would result in a revenue shortfall.

All surplus revenues are currently placed in the District's reserve, which is used to fund emergency repairs, the steel line replacement program, and other water system capital improvements.

The plan indicates annual water system revenue declines due to conservation during the 4 stages of alert range from 3 to 9 percent. Financial reserves of the District are adequate to offset these modest decreases in revenue.

8.10 Mechanism to Determine Reductions in Water Use

Demand

JBWD bills their customers on a monthly basis. The prior year's consumption is included on customer's bills. This allows comparison of the total consumption from each billing period to the same billing period from the prior year.

Production

Under normal water supply conditions, production figures are recorded daily in the District's computerized database. Total production measurements are taken in the field and the data is totaled. High demand days are determined at the end of each month as well as at the end of the year. Water storage reservoirs and well and booster pumping plants are monitored on a continuous basis by telemetry at the District's headquarters, with alarms for abnormal conditions.

Stage 1 and 2 Water Shortages

During Stage 1 and 2 Water Shortages, daily production figures will be reported to the Water Production Supervisor who will compare the weekly production to the target weekly production to verify that the reduction goal is being met. Weekly reports will be forwarded to the General Manager.

Monthly reports will be provided to the Board of Directors and to the Customer Service Department. The Customer Service Department will serve as the District's Water Shortage Response Team. If reduction goals are not met, the Water Shortage response Team will examine individual customer usage and corrective action will be taken.

Stage 3 and 4 Water Shortages

During Stage 3 and 4 Water Shortages, the procedure listed for Stages 1 and 2 will be followed with the addition of a daily production report to the General Manager.

Disaster Shortage

During a disaster shortage, production figures will be reported to the Water Production Supervisor hourly and to the General Manager and Water Shortage Response team daily.

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